





## **Workshop Manual**

# **TCD 2013 4V** **Industry**

**0312 3132 en**

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## **1 Foreword**



- Read and observe the information in this documentation. You will avoid accidents, retain the manufacturer's warranty and possess a fully functional and ready to operate engine.
- This engine is built exclusively for purpose according to the scope of delivery - defined by the equipment manufacturer (use for the intended purpose). Any use above and beyond this is considered improper use. The manufacturer will not be liable for damages resulting from this. The user bears the sole risk.
- Use for the intended purpose also includes observance of the operating, maintenance and repair instructions specified by the manufacturer. The engine may only be used, maintained and repaired by persons who are familiar with this and are aware of the risks involved.
- Make sure that this documentation is available to everyone involved in the operation, maintenance and repair and that they have understood the contents.
- Failure to observe this documentation may lead to malfunctions and engine damage as well as injury to persons for which the manufacturer will not accept any liability.
- Prerequisite for proper maintenance and repair is the availability of all the necessary equipment, conventional and special tools and their perfect condition.
- Engine parts such as springs, clamps, elastic retaining rings etc. pose an increased risk of injury when handled incorrectly.
- The pertinent rules for the prevention of accidents and other generally recognised health and safety regulations must be observed.
- Maximum economy, reliability and long life is only guaranteed when using DEUTZ original parts.
- Repair of the engine must correspond to its use for the intended purpose. Only parts released by the manufacturer for the respective purpose may be used for conversion work. Unauthorised modifications to the engine exclude manufacturer liability for resulting damages. Failure to observe this will void the warranty!
- The engines made by DEUTZ are developed for a wide range of applications. A wide range of variants ensures that the respective special requirements are met.
- The engine is equipped according to the installation case, i.e. not all the parts and components described in this documentation are installed in your engine necessarily.
- We have done our best to highlight the differences so that you can easily find the operating, maintenance and repair instructions relevant to your engine.

We are at your service for any questions you may have in this matter.

Your DEUTZ AG



## **2 General**





**DEUTZ engines** are the product of years of research and development. The profound expertise gained through this, in combination with high demands on quality, attests to the fact that our engines possess all the qualities of long life, high reliability and low fuel consumption. It goes without saying that the high environmental protection requirements are also met.

**Maintenance and care** are the only way the engine can satisfy the demands you make on it. Compliance with the prescribed maintenance times and the careful execution of maintenance and care work are therefore essential. Difficult operating conditions, deviating from normal operation, must be particularly heeded.

Please consult one of our service representatives responsible for operating faults and spare parts questions. Our trained specialist personnel ensures fast and professional repairs using original DEUTZ spare parts in the event of damage.

**Original spare parts** from DEUTZ AG are always manufactured according to the state of the art.



### 3 User notes



### 3.1 General

The documentation of the workshop manual has been created based on the engine available at the time of going to press.

There may be deviations in the descriptions, illustrations and parts due to further developments.

The maintenance work described in the operation manual and in the workshop manual must be carried out on schedule and completely. The maintenance personnel must have the necessary technical knowledge to perform the work. Safety and protection devices which are removed during maintenance work must be replaced again afterwards.

**Caution!**

The rules for the prevention of accidents and the safety regulations must be observed during maintenance work.

Reference is made in the workshop manual job cards to the regulations in chapter 3.2. These must be read before working on the engine and must be strictly followed.

The maintenance intervals and the work to be performed are specified in the maintenance schedule of the operation manual. The job cards contain technical documentation on the execution of maintenance work.

### 3.2 Specifications

#### 3.2.1 Accident prevention and safety regulations

The legally prescribed rules for the prevention of accidents must be observed. These are available from professional associations or from dealers. These are dependent on the application site, operating mode and the operating and auxiliary materials being used.

Special protection measures are specified depending on the work being carried out, and are identified in the job description.

Among other things it generally applies that:

- for the personnel:
  - Only briefed personnel may operate or maintain the engine. Unauthorised persons are prohibited access to the machine room.
  - Wear close-fitting clothing and ear protectors in the machine room when the engine is in operation.
  - Only deploy trained personnel to do repairs and maintenance work.
  - Do not work on the fuel system when the engine is running. The fuel system is under high pressure - danger of death.
  - Go to the workshop immediately in case of leaks in the fuel system.
- for the engine room:
  - Ensure adequate ventilation (do not cover air shafts).
  - Provide first aid kit and suitable fire extinguishers. Check the filling and readiness for operation regularly.
  - Only store inflammable materials in the machine room if they are essential for operation of the system.
  - Smoking and naked flames are prohibited in the machine room.
- for operation, maintenance and repairs on the engine:
  - Wait 30 seconds after switching off the engine before working on the fuel system.
  - After all work on the fuel system, it must be bled - see the operation manual, chapter "6.2 Fuel system".
  - Only start the engine when all the protective devices have been fitted. Make sure no-one is standing in the danger area.
  - Cleaning, maintenance and repair work may only be performed with the engine at a standstill and secured against starting.
  - Injection lines and high pressure pipes must not be deformed.

- Damaged injection lines and high-pressure pipes must be renewed.
- Injection lines and high pressure fuel lines must never be connected when the engine is running.
- Do not place hands near to a leak in the high pressure fuel system.
- Also carefully check all high pressure components visually before performing tests on the running engine. Wear suitable protective clothing (for example protective glasses). Leaks are a potential source of danger for workshop personnel.
- Even if no leaks are discernible on the high pressure fuel system, the workshop personnel should avoid the immediate danger zone or wear suitable protective clothing (such as protective glasses) when performing tests on the running engine and during the first trial run.
- Always stay out of range of a fuel jet, as it could cause severe injury.
- Smoking is strictly prohibited when working on the fuel system.
- Do not work near to sparks and flames.
- Never disconnect an injector when the engine is running.

### 3.2.2 Cleanliness instructions and measures for handling the DEUTZ Common Rail System

The DEUTZ Common Rail system used in the DEUTZ engines consists of high-precision components which are exposed to extreme stress. Great attention must be paid to cleanliness when working on the fuel system due to the high precision technology.

#### Notes and measures to be observed before starting work on the fuel system

- The fuel system must be closed. Make a visual inspection for leaks / damage to the fuel system.
- Clean the whole engine and engine room with the system closed before starting work on the fuel system.
- The engine must be dry when you start working on the fuel system.
- Blowing (dry) with compressed air is only permissible with the fuel system closed.
- When using a steam jet, first cover up the control unit, the cable plugs, all other electrical plug connections and the generator. Also, the steam jet may not be pointed directly at them.
- Electrical plug connections must be plugged when spraying.
- Remove loose parts (for example paint chips from assembly work) with an industrial vacuum cleaner or other suction device. Only suction may be used in assembly work on the open fuel system.
- Only work on the fuel system in a clean environment (no dust, no grinding or welding). Avoid draughts (dust). Clean the workshop floor regularly. No brake or performance test benches may be kept or operated in the same room.
- Air currents which kick up dust, such as those caused by brake repairs or the starting of engines, should be avoided.
- For work such as removal and installation on defective hydraulic components on the Common Rail System it is recommended to partition off a separate workshop area in the factory. This must be separate from other areas in which general vehicle repairs such as brake repairs are carried out.
- No general machine tools may be operated in this room.
- Regular cleaning of the workshop area is mandatory. Draughts, ventilation systems and heating fans should be minimised.
- Areas of the engine room from which particles of dirt could be loosened (for example the bottom part of the tipped driver cab) must be covered with fresh clean film.
- Working materials and tools must be cleaned before work. Only use tools without damage to the chrome plating or tools which are not chrome-plated.

#### Notes and measures to be observed during work on the fuel system or with the fuel system open.

- Only work in clean overalls.
- Only lint-free cleaning cloths may be used for work on the fuel system.
- Remove loose parts (for example paint chips from assembly work) with an industrial vacuum cleaner or other suction device. Only suction may be used in assembly work on the open fuel system.
- Working materials and tools must be cleaned before work. Only use tools without damage to the chrome plating or tools which are not chrome-plated.
- Do not use used cleaning fluid or test fluid for cleaning.
- Compressed air must not be used for cleaning on the open fuel system.
- Work on removed components may only be performed at a suitably equipped workbench.

- When removing and installing components, no materials which can leave behind particles or fibres (cardboard, wood, cloths) may be used.
- Removed parts may only be rubbed down with clean, lint-free cloths. No dirt particles may be rubbed into the components.
- Openings on the components and on the engine must be closed immediately with suitable stoppers/caps.
- The stoppers/caps may only be removed immediately before installing.
- Store stoppers/caps free from dust and dirt in the original packaging and dispose of after using once.
- Only remove new parts from the original packaging just before installation.
- Removed components must be kept in new, sealable bags or - if available - in the packaging of the new parts.
- Always use the original packaging of the new part to send back the removed components.

#### **Notes and measures for the vehicle workshop area**

- For work such as removal and installation on defective hydraulic components on the Common Rail System it is recommended to partition off a separate workshop area in the factory. This must be separate from other areas in which general vehicle repairs such as brake repairs are carried out.
- The workshop floor is sealed or tiled.
- No welding gear, grinders, general machine tools, brakes or performance test benches may be operated in this room.
- Regular cleaning of the workshop area is mandatory. Draughts, ventilation systems and heating fans should be minimised.

#### **Notes and measures for workbench and tools in the vehicle hall**

- A special workbench must be set up for work on removed components.
- Clean the removal and installation tools regularly and keep them in a closed tool cabinet.
- Remove loose parts (for example paint chips from assembly work) with an industrial vacuum cleaner or other suction device.
- Working materials and tools must be cleaned before work. Only use tools without damage to the chrome plating or tools which are not chrome-plated.

### **3.2.3 Disposal regulations**

The work described in the operation manual and workshop manual necessitates renewal of parts and

operating materials among other things. The renewed parts / operating materials must be stored, transported and disposed of according to regulations. The owner himself is responsible for this.

Disposal includes recycling and the scrapping of parts / operating materials, although recycling has priority.

Details of disposal and their monitoring are governed by regional, national and international laws and directives which the system operator must observe on his own responsibility.

### 3.3 Operation manual and workshop manual

To structure the information to suit the user, the service documentation is divided into operation manual and workshop manual.

The operation manual contains a general description and instructions for all other maintenance work.

It contains the following chapters:

1. Contents, General
2. Engine description
3. Operation
4. Operating media
5. Maintenance
6. Care and maintenance work
7. Faults, causes and remedies
8. Engine conservation
9. Technical data
10. Service

The workshop manual assumes knowledge of the contents of the operation manual. This applies especially for the safety regulations. The workshop manual describes repairs to the engine and components for which more effort and appropriately qualified technicians are required.

### 3.4 Job cards

The job cards are divided in the workshop manual into "W" and "I" job cards.

The "W" job card documents standard repairs on the engine and/or its components. The necessary tools and special tools are also specified in the "W" job card.

The "I" job card additionally documents the appropriate work procedures for repairing the engine and/or its components. The workshop must satisfy special conditions to perform these work procedures. Special tools and machine tools must be available, for example.

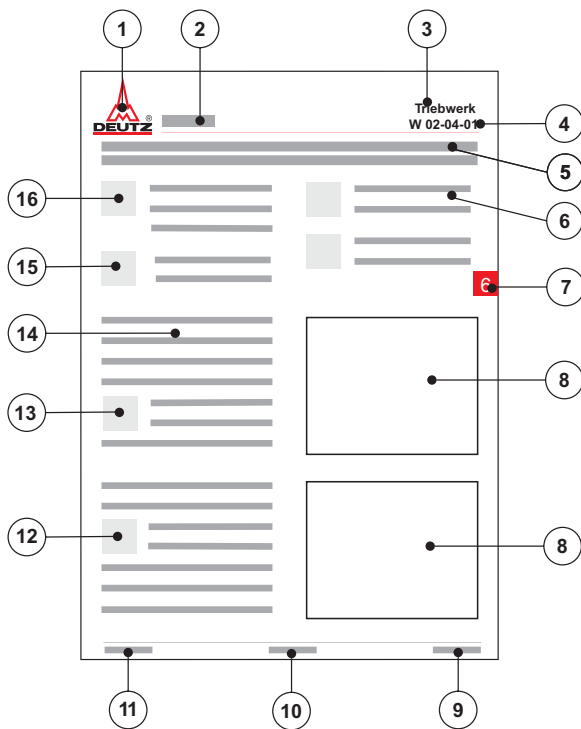
#### 3.4.1 Numbering of job cards

The job card numbers follow the pattern **W 02-04-01**. The individual parts of this pattern are explained below:

- **W 02-04-01**: Documentation type
  - **W**.... Workshop manual
  - **I**..... Repair instructions
- **W 02-04-01**: Maintenance group
  - 00 ... General / interdisciplinary activities
  - 01 ... Cylinder head
  - **02** ... Drive system
  - 03 ... Crankcase
  - 04 ... Engine control system
  - 05 ... Speed governing
  - 06 ... Exhaust system / Charging
  - 07 ... Fuel system
  - 08 ... Lube oil system
  - 09 ... Cooling system
  - 10 ... Compressed air system
  - 11 ... Monitoring system
  - 12 ... Other components
  - 13 ... Electrical system
- **W 02-04-01**: Component grouping
- **W 02-04-01**: Consecutive number



## 3.4.2 Structure of a job card



1. DEUTZ AG,  
publisher of service documentation
2. Engine type (e.g. TCD 2013 4V)
3. Maintenance group
4. Job card number or topic
5. Title of job card
6. Reference to other job cards
7. Chapter
8. Graphic or photo
9. DEUTZ internal creation number
10. Page number
11. Date of issue of job card
12. Note
13. Danger / Important
14. Work sequence
15. Special tools; auxiliary materials
16. Conventional tools

## 3.5 Explanation of symbols



### Danger!

of death or to health. Must be observed!  
For example: The incorrect use or conversion of the turbocharger can lead to serious injury.



### Caution!

Danger to the component/engine. Non-compliance can lead to destruction of the component/engine.  
Must be observed!



### Note

General notes on assembly, environmental protection etc. No potential danger for man or machine.



### Tool

Conventional and special tools required for the work.



### Auxiliary materials

Working materials required in addition to the tools for performing the work (e.g. greases, oils, adhesives, sealants)



### References

to important documents or job cards for the work process.

For example: Job card W 04-05-05



### Reference

to a document or a job card within the work process.



### Test and setting data

The necessary values are specified here. If several values are necessary, a cross reference is given to the Test and Setting Values table.

For example:

ID no. P01 61 = valve clearance, inlet



### Tightening specification

The necessary values are specified here. If several values are necessary, a cross reference is given to the Tightening Specifications table.

For example:

ID no. A01 001 = cylinder head screws



## **4 Technical data**

### **4.1 Testing and setting data**



ID no.	Name	Information	Series			Value	Unit
General engine data							
P00 01	Length of engine		TCD 2013	L4	4V	1010	mm
				L6	4V	1218	mm
P00 02	Width of engine		TCD 2013	L4	4V	780	mm
				L6	4V	780	mm
P00 03	Height of engine		TCD 2013	L4	4V	908	mm
				L6	4V	983	mm
P00 04	Engine weight according to DIN 70020-A approx.		TCD 2013	L4	4V	530	kg
				L6	4V	620	kg
P00 10	Working principle		TCD 2013		4V	Four-stroke diesel	-
P00 20	Combustion process		TCD 2013		4V	Direct injection	-
P00 30	Total volume		TCD 2013	L4	4V	4761	cm3
				L6	4V	7142	cm3
P00 31	Bore		TCD 2013		4V	108	mm
P00 32	Stroke		TCD 2013		4V	130	mm
P00 40	Compression ratio		TCD 2013		4V	18	-
P00 50	Direction of rotation	looking onto the flywheel	TCD 2013		4V	left	-
P00 71	Ignition sequence		TCD 2013	L4	4V	1 - 3 - 4 - 2	-
				L6	4V	1 - 5 - 3 - 6 - 2 - 4	-
Cylinder head							
P01 01	Valve seat ring bore, inlet	Standard, fit H7	TCD 2013		4V	39,2	mm
P01 02	Valve seat ring bore, outlet	Standard, fit H7	TCD 2013		4V	36,7	mm
P01 05	Valve guide, bore in cylinder head	Standard, fit H6	TCD 2013		4V	13 <sup>+0,1</sup> <sub>-0,1</sub>	mm
P01 08	Cylinder head, height	Standard	TCD 2013		4V	110	mm

ID no.	Name	Information	Series			Value	Unit
Valve guide							
P01 11	Valve guide external diameter	Standard, fit s6	TCD 2013		4V	13 <sup>+0,039 +0,028</sup>	mm
P01 14	Valve guide inside diameter, inlet	Standard H8	TCD 2013		4V	8 <sup>+0,1 -0,1</sup>	mm
P01 15	Valve guide inside diameter, outlet	Standard H8	TCD 2013		4V	8 <sup>+0,1 -0,1</sup>	mm
Valve seat ring							
P01 21	Valve seat ring outside diameter inlet	Standard	TCD 2013		4V	39,313 <sup>+0,008 -0,008</sup>	mm
P01 22	Valve seat ring outside diameter outlet	Standard	TCD 2013		4V	36,813 <sup>+0,008 -0,008</sup>	mm
Valve							
P01 31	Valve shaft diameter inlet	Standard, fit h7	TCD 2013		4V	7,965 <sup>0 -0,015</sup>	mm
P01 32	Valve shaft diameter outlet	Standard, fit h7	TCD 2013		4V	7,955 <sup>0 -0,015</sup>	mm
P01 33	Valve stem clearance inlet		TCD 2013		4V	0,01 - 0,03	mm
P01 34	Valve stem clearance outlet		TCD 2013		4V	0,02 - 0,04	mm
P01 37	Valve head diameter inlet		TCD 2013		4V	38,2 <sup>+0,1 -0,1</sup>	mm
P01 38	Valve head diameter outlet		TCD 2013		4V	35,8 <sup>+0,1 -0,1</sup>	mm
Valve seat							
P01 41	Valve seat width inlet		TCD 2013		4V	2,32	mm
P01 42	Valve seat width outlet		TCD 2013		4V	2,68	mm
P01 45	Valve standback dimension inlet with seat ar- mouring		TCD 2013		4V	1,25 <sup>+0,25 +0,1</sup>	mm
P01 46	Valve standback dimension outlet		TCD 2013		4V	1,25 <sup>+0,25 +0,1</sup>	mm
P01 47	Valve seat angle inlet		TCD 2013		4V	30 <sup>+0,5 -0,5</sup>	°
P01 48	Valve seat angle outlet		TCD 2013		4V	45 <sup>+1,0 -1,0</sup>	°

ID no.	Name	Information	Series			Value	Unit
Valve spring							
P01 51	Valve spring (unclamped normal), length		TCD 2013		4V	64,48	mm
	Valve spring wire diameter		TCD 2013		4V	3,95	mm
Valve clearance							
P01 61	Valve clearance, inlet	on cold engine, (oil temperature < 80 °C), after a cooling down time of at least 0.5 h	TCD 2013		4V	75	°
P01 62	Valve clearance, outlet	on cold engine, (oil temperature < 80 °C), after a cooling down time of at least 0.5 h	TCD 2013		4V	105	°
P01 63	Valve clearance setting	Valve overlap as per setting diagram, see: Table T01 63	TCD 2013		4V	-	-
Rocker arm/bracket							
P01 71	Rocker arm bracket, bore	Diameter	TCD 2013		4V	22 <sup>+0,053 +0,02</sup>	mm
P01 74	Rocker arm axis	Diameter, fit h7	TCD 2013		4V	22 <sup>+0 -0,021</sup>	mm
Driving gear							
Main bearing pin							
P02 03	Main bearing pin (normal)	Diameter mm	TCD 2013		4V	85 <sub>-0,02</sub>	mm
P02 04	Main bearing pin	2 undermeasure stages per	TCD 2013		4V	0,25	mm
P02 07	Main bearing pin, hardness	Standard HRc	TCD 2013		4V	53 <sup>+3</sup>	HRc
Fit bearing pin							
P02 11	Fit bearing pin, width		TCD 2013		4V	33,9 <sup>+0,06</sup>	mm
P02 12	Fit bearing pin	1 undermeasure stage per	TCD 2013		4V	0,4	mm

ID no.	Name	Information	Series			Value	Unit
Lifting journal							
P02 21	Lifting journal, width		TCD 2013		4V	37,4 <sup>+0,04</sup> <sub>-0,04</sub>	mm
P02 22	Lifting journal, diameter		TCD 2013		4V	75 <sub>-0,02</sub>	mm
P02 23	Lifting journal, diameter	2 undermeasure stages per	TCD 2013		4V	0,25	mm
P02 26	Radial run-out, crankshaft	maximum permissible deviation	TCD 2013		4V	0,10	mm
Crankshaft main bearing							
P02 31	Main bearing shells, inside diameter	Standard	TCD 2013		4V	85,03 - 85,072	mm
P02 32	Main bearing shells, inside diameter	2 undermeasure stages per	TCD 2013		4V	0,25	mm
P02 33	Theoretical clearance between main bearing / crankshaft		TCD 2013		4V	0,03 - 0,092	mm
P02 34	Permissible axial clearance of crankshaft		TCD 2013		4V	0,1 - 0,32	mm
P02 35	Wearing ring thickness	Standard (upper and lower half)	TCD 2013		4V	2,9 <sup>+0,05</sup>	mm
P02 36	Wearing ring oversize	1. Stage = 0.2 mm	TCD 2013		4V	3,1 <sup>+0,05</sup>	mm
Con-rod							
P02 43	Piston bolt liner, inside diameter	Nominal value	TCD 2013		4V	45 <sup>+0,05</sup> <sub>+0,04</sub>	mm
P02 44	Piston bolt liner, outside diameter		TCD 2013		4V	48,070 - 48,110	
P02 45	Theoretical clearance between		TCD 2013		4V	0,04 - 0,056	mm
P02 49	Con-rod, piston bolt liner, bore		TCD 2013		4V	48 <sup>+0,02</sup> <sub>0</sub>	mm
Big-end bearing							
P02 51	Big end bearing shell top and bottom, width		TCD 2013		4V	29,2 <sub>-0,5</sub>	mm
P02 52	Big-end bearing shells, inside diameter	installed	TCD 2013		4V	75,036 - 75,076	mm
P02 54	Big-end bearing undermeasure per stage	2 undermeasure stages per	TCD 2013		4V	0,25	mm
P02 55	Big-end bearing, bore		TCD 2013		4V	80 <sup>+0,02</sup> <sub>0</sub>	mm
P02 56	Theoretical clearance between the big-end bearing / lifting journal		TCD 2013		4V	0,036 - 0,096	mm



ID no.	Name	Information	Series			Value	Unit
Piston bolt							
P02 61	Piston bolt diameter		TCD 2013		4V	$45^{0}_{-0,006}$	mm
Piston identification of the installation position on the piston base							
P02 71	Piston, diameter, standard	Measuring point 1 = height 12 mm	TCD 2013		4V	107,88	mm
P02 72	Piston, diameter, standard	Measuring point 2 = height 64mm	TCD 2013		4V	107,768	mm
P02 73	Piston, diameter, standard	Measuring point 3 = height 83mm	TCD 2013		4V	107,63	mm
P02 75	Piston projection	1 hole, cylinder head gasket, 1.15 mm	TCD 2013		4V	0,31 - 0,40	mm
P02 76	Piston projection	2 hole, cylinder head gasket, 1.25 mm	TCD 2013		4V	0,41 - 0,50	mm
P02 78	Piston bolt, bore		TCD 2013		4V	$45^{+0,18}_{+0,08}$	mm
Piston rings							
P02 81	Piston ring 1, double-sided trapeze ring	Outside diameter/inside diameter x height	TCD 2013		4V	108/99,1x3.5	mm
P02 82	Piston ring 2, minute ring	Outside diameter/inside diameter x height	TCD 2013		4V	108/99x2.0	mm
P02 83	Piston ring 3, roof chamfer ring with hose spring	Outside diameter/inside diameter x height	TCD 2013		4V	108/100,1x3.5	mm
P02 84	Joint clearance, piston ring 1	Identification "TOP" in direction of combustion chamber	TCD 2013		4V	$0,3^{+0,15}$	mm
P02 85	Joint clearance, piston ring 2	Identification "TOP" in direction of combustion chamber	TCD 2013		4V	1,5 - 2,0	mm
P02 86	Joint clearance, piston ring 3	Identification "TOP" in direction of combustion chamber	TCD 2013		4V	$0,25^{+0,3}$	mm
P02 87	Axial clearance, piston ring 1		TCD 2013		4V	measure	-
P02 88	Axial clearance, piston ring 2		TCD 2013		4V	0,07 - 0,105	mm
P02 89	Axial clearance, piston ring 3		TCD 2013		4V	0,03 - 0,075	mm
P02 95	Piston ring joint, installation position		TCD 2013		4V	offset 120	°

ID no.	Name	Information	Series			Value	Unit
P02 96	Roof chamfer ring	Offset spring ring joint to ring joint	TCD 2013		4V	180	°
Crankcase							
Camshaft bearing							
P03 11	Camshaft bearing, crankcase bore		TCD 2013		4V	$77^{+0,019}$	mm
P03 12	Camshaft bearing, outside diameter	Standard	TCD 2013		4V	77,100 - 77,145	mm
P03 13	Camshaft bearing, inside diameter	Liner not mounted	TCD 2013		4V	73,100 - 73,175	mm
Main bearing bore							
P03 21	Main bearing bore in crankcase	Standard	TCD 2013		4V	90,500 - 90,520	mm
P03 25	Corrugated sealing ring (front cover) installation depth max.	First assembly	TCD 2013		4V	0 - 0,5	mm
Cylinder liners							
P03 31	Cylinder liner, bore	Standard	TCD 2013		4V	$108^{+0,02}_0$	mm
P03 36	Cylinder liner, collar height		TCD 2013		4V	$8,07^{0}_{-0,02}$	mm
P03 39	Cylinder liner, overhang		TCD 2013		4V	$0,1^{0,05}_0$	mm
Control system							
Camshaft							
P04 31	Camshaft bearing pin, diameter	Standard	TCD 2013		4V	$73^{0}_{-0,05}$	mm
P04 32	Theoretical radial clearance		TCD 2013		4V	0,1 - 0,6	mm
P04 35	Camshaft axial clearance	Nominal	TCD 2013		4V	0,1 - 0,6	mm
Fuel system							
Injection valve							
P07 51	Nozzle type injector		TCD 2013		4V	7-hole	-
P07 71	System pressure, DEUTZ Common Rail	High pressure range	TCD 2013		4V	300 - 1600	bar

ID no.	Name	Information	Series			Value	Unit
Cooling system							
P09 11	Coolant thermostat, start of opening		TCD 2013		4V	86 +2 / +2	°C

**T01 63**

**Set valve clearance**

4-cylinder

ignition sequence: 1 - 3 - 4 - 2

Valves	Cylinder			
overlap	1	3	4	2
set to	4	2	1	3

4



Valve overlap: Outlet valve is not yet closed, inlet valve begins to open.

**T01 63**

**Set valve clearance**

6-cylinder

ignition sequence: 1 - 5 - 3 - 6 - 2 - 4

Valves	Cylinder					
overlap	1	5	3	6	2	4
set to	6	2	4	1	5	3



Valve overlap: Outlet valve is not yet closed, inlet valve begins to open.

## **4.2 Tightening specifications**



ID no.	Name	Screw type	Notes / Remarks	Series			Pre-clamping value	Post-clamping value
A00 001	Clamping bracket on crankcase			TCD 2013		4V	70 Nm	
A00 002	Clamping bracket on adapter for engine assembly block			TCD 2013		4V	90 Nm	
A01 001	Cylinder head on crankcase	M15x2-135 M15x2-170	Use new screws.	TCD 2013		4V	40 Nm	95 Nm +180 °
A01 002	Toggle level block on cylinder head	M8x100	with two clamping sleeves	TCD 2013		4V	21 Nm	
A01 003	Lock nut, valve clearance setting screw	M10		TCD 2013		4V	20 Nm	
A01 004	Cylinder head cover on cylinder head	M6	Gasket can be reused several times if there is no damage	TCD 2013		4V	8.5 Nm	
A02 010	Main bearing on crankcase	M18x2.5-10.9	Screws can be used a max. 3 times, otherwise renew every time they are loosened.	TCD 2013		4V	50 Nm	+60 ° +60 °
A02 020	Con rod screws on con rod	M12x1.5x73	Use new screws.	TCD 2013		4V	30 Nm	+60 ° +60 °
A02 071	Piston cooling nozzle on crankcase	M8x35		TCD 2013		4V	21 Nm	
A03 007	Locking screw on crankcase (coolant)	AM14x1.5-ST-A4C	with sealing ring	TCD 2013		4V	34 Nm	
A03 020	Front cover on crankcase	M8x35 M8x70	with 1 clamping sleeve	TCD 2013		4V	30 Nm	
A03 030	Oil pan on crankcase (heavy duty version)	M8x40-10.9 M8x160-10.9	Observe tightening sequence.	TCD 2013		4V	35 Nm	
A03 031	Locking screw on the oil pan	M18x1.5		TCD 2013		4V	55 Nm	
A03 060	Crankcase breather on cylinder head	M8x30-10.9		TCD 2013		4V	20 Nm	
A03 061	Pipe clip for return line	M8x16-10.9		TCD 2013		4V	13 Nm	
A03 062	Return line on pipe union (gearcase)	Lock nut		TCD 2013		4V	20 Nm	

ID no.	Name	Screw type	Notes / Remarks	Series			Pre-clamping value	Post-clamping value
A03 064	Pipe clip breather pipe (open) at holder	M6x16-10.9		TCD 2013		4V	8.5 Nm	
A03 065	Holder oil return line (pipe clip)	M6		TCD 2013		4V	8.5 Nm	
A03 066	Holder oil return line	M6x12		TCD 2013		4V	13 Nm	
A03 067	Holder oil return line	M6x40		TCD 2013		4V	13 Nm	
A03 069	Crankcase breather, housing top part on housing bottom part			TCD 2013		4V	6 Nm	
A03 080	Gearcase on crankcase	M8x30-10.9 M8x70-10.9	Observe tightening sequence.	TCD 2013		4V	30 Nm	
A03 081	Gearcase on crankcase	M12x130-10.9 M12x190-10.9	Observe tightening sequence.	TCD 2013		4V	110 Nm	
A03 082	Gearcase on crankcase	M16x120-10.9 M16x200-10.9	Observe tightening sequence.	TCD 2013		4V	260 Nm	
A03 083	Gearcase on crankcase	M18x70-10.9	Observe tightening sequence.	TCD 2013		4V	360 Nm	
A03 085	Connection housing cover	M8x20		TCD 2013		4V	30 Nm	
A03 091	Gearcase on crankcase	M12x80-10.9	Observe tightening sequence.	TCD 2013		4V	110 Nm	
A03 092	Gearcase on crankcase	M8x30-10.9 M8x65-10.9	Observe tightening sequence.	TCD 2013		4V	30 Nm	
A05 011	Speed governor crankshaft on gearcase	M6x16		TCD 2013		4V	8.5 Nm	
A05 012	Speed governor camshaft on gearcase	M6x16		TCD 2013		4V	8.5 Nm	
A06 001	Exhaust pipe at cylinder head	M10x85	Use new screws.	TCD 2013		4V	15 Nm	45 Nm
A06 020	Turbocharger on exhaust pipe	M10	nut	TCD 2013		4V	42 Nm	
A06 030	Charge air line, fastening	M8x95 M8x130-10.9 M8		TCD 2013		4V	30 Nm	



ID no.	Name	Screw type	Notes / Remarks	Series			Pre-clamping value	Post-clamping value
A06 041	Pin bolt on charge air pipe	M8x100-8.8	Pin bolt				20 Nm	
A06 042	Mixing pipe on heating flange/charge air pipe	M8	Nut				20 Nm	
A06 060	Cooler on charge air pipe (exhaust gas return)	M8x35-10.9					20 Nm	
A06 061	Flutter valve housing on cooler (exhaust gas return)	M6x40-10.9	Bolt and nut				8.5 Nm	
A06 062	Shutoff valve on cooler (exhaust gas return)	M8x28	Bolt and nut				20 Nm	
A06 063	Compensator on exhaust pipe/shutoff valve	M8	Nut, bolt				20 Nm	
A06 064	Pipe on mixer pipe/cooler (exhaust gas return)	M8x12-10.9					20 Nm	
A06 065	Holder actuator on charge air pipe	M8x20					20 Nm	
A06 066	Actuator on holder	M6	Nut				8.5 Nm	
A06 067	Adjusting lever on actuator	M10	Nut				42 Nm	
A06 068	Adjusting rod on lever	M8x20, M8	Bolt and nut				20 Nm	
A07 001	Clamping claw injector on cylinder head	BM8x40 Torx	Observe tightening specification. Loosen bolt after tightening with pre-tightening value.	TCD 2013		4V	4 Nm	23 Nm
A07 003	Injection lines on rail and pressure pipe nozzles High-pressure line on high-pressure pump	Lock nut	SW17	TCD 2013		4V	25 Nm	
A07 024	Fuel pump on gearcase	M8x25		TCD 2013		4V	30 Nm	
A07 031	High pressure pump on crankcase	M10x30 multi-tooth		TCD 2013		4V	10 Nm	50 Nm
A07 032	Control block on crankcase	M8x75 M8x85		TCD 2013		4V	30 Nm	
A07 034	Fuel pipe on high pressure pump	D8	Hollow screw Observe assembly specification.	TCD 2013		4V	26 Nm	

ID no.	Name	Screw type	Notes / Remarks	Series			Pre-clamping value	Post-clamping value
A07 035	Fuel pipe on control block	D10	Hollow screw Observe assembly specification.	TCD 2013		4V	34 Nm	
A07 036	Union screw for pressure pipe nozzle	M22x1.5	Observe the tightening specification.	TCD 2013		4V	20 Nm	52 Nm
A07 037	Pressure piece on the cylinder head	M26x1.5		TCD 2013		4V	80 Nm	
A07 038	Rail at cylinder head	M8x30	Observe the tightening specification.	TCD 2013		4V	30 Nm	
A07 039	Insert pressure limiting valve on rail		with mounting compound	TCD 2013		4V	100 Nm	
A07 040	Insert rail pressure sensor on rail		with mounting compound	TCD 2013		4V	70 Nm	
A07 041	Pipe clip on gearcase	M8x30		TCD 2013		4V	30 Nm	
A07 042	Holder for pipe clip on gearcase	M8x16		TCD 2013		4V	30 Nm	
A07 044	Pipe clip fuel pipe	M6x16		TCD 2013		4V	13 Nm	
A07 045	Fuel pipe (feed) on control block Fuel pipe (return) on rail	M14x1.5	Hollow screw	TCD 2013		4V	39 Nm	
A07 046	Fuel pipe (return) on control block	M16x1.5	Hollow screw	TCD 2013		4V	49 Nm	
A07 047	Fuel line (return) on cylinder head	M12x1.5	Hollow screw	TCD 2013		4V	29 Nm	
A07 050	Cooling coil on control unit			TCD 2013		4V	10 Nm	
A07 086	Cover fuel filter on fuel filter console			TCD 2013		4V	25 Nm	
A07 087	Fuel filter console on oil cooler housing	M8x60		TCD 2013		4V	30 Nm	
A07 088	Heating element on fuel filter console		in case of repair (self-tapping screw)	TCD 2013		4V	10 Nm	
A07 090	Fuel pressure sensor on fuel filter console			TCD 2013		4V	30 Nm	
A08 040	Lubricating oil pipe on exhaust gas turbocharger Lubricating oil pipe on crankcase	D10	Hollow screw	TCD 2013		4V	39 Nm	

ID no.	Name	Screw type	Notes / Remarks	Series			Pre-clamping value	Post-clamping value
A08 044	Pipe union (oil return) on exhaust gas turbocharger	M8x20		TCD 2013		4V	30 Nm	
A08 046	Holding bracket (oil return) on crankcase	M8x16		TCD 2013		4V	30 Nm	
A08 050	Oil cooler housing on crankcase	M8x100-10.9 M8x180-10.9		TCD 2013		4V	30 Nm	
A08 051	Oil cooler housing on crankcase	M10x100-10.9 M10x180-10.9	Observe tightening sequence.	TCD 2013		4V	3 Nm	60 Nm
A08 052	Oil cooler on oil cooler housing			TCD 2013		4V	22 Nm	
A08 091	Oil pressure switch on oil cooler housing						30 Nm	
A09 001	Thermostat housing on cylinder head	M8x30-10.9 M8x65-10.9 M8x25		TCD 2013		4V	30 Nm	
A09 002	Outlet branch on thermostat housing	M8x30-10.9 M8x55		TCD 2013		4V	30 Nm	
A09 009	Holder (generator) on coolant pump	M6x16		TCD 2013		4V	8.5 Nm	
A09 010	Coolant pump on support plate	M8x50-10.9 M8x95-10.9		TCD 2013		4V	30 Nm	
A09 013	Heating rod housing on crankcase	M8x25		TCD 2013		4V	30 Nm	
A09 031	Temperature sensor on thermostat housing	M12x1.5		TCD 2013		4V	22 Nm	
A09 080	Pipe (coolant) on cooler (exhaust gas return)	M8x25-10.9 M8	Bolt and nut	TCD 2013		4V	20 Nm	
A12 001	Flywheel on crankshaft	M10x1x45	Use new screws.	TCD 2013		4V	30 Nm	+60 ° +60 °
A12 030	Torsional vibration damper on crankshaft	M16x1.5x80 Torx	Use new screws.	TCD 2013		4V	30 Nm	+60 ° +60 °
A12 031	V-rib belt pulley on torsional vibration damper	M12x75-10.9 M12x140-10.9		TCD 2013		4V	110 Nm	

ID no.	Name	Screw type	Notes / Remarks	Series			Pre-clamping value	Post-clamping value
A12 041	Belt tightener on console	M10x80	Observe assembly specification.	TCD 2013		4V	42 Nm	
A12 044	Idler rollers on console	M10x45 M10x65		TCD 2013		4V	42 Nm	
A12 044	Idler roller on bearing block			TCD 2013		4V	50 Nm	
A12 051	Air conditioning compressor on console	M10x50		TCD 2013		4V	20 Nm	
A12 054	Console air conditioning compressor on crankcase	M10x50 M10x65		TCD 2013		4V	60 Nm	
A12 055	Holder for idler roller on console air conditioning compressor	M8X40		TCD 2013		4V	30 Nm	
A12 091	Hollow screw pipe union	M10x1	Ring piece, pipe 6mm	TCD 2013		4V	29 Nm	
A12 092	Hollow screw pipe union	M12x1.5	Ring piece, pipe 8mm	TCD 2013		4V	39 Nm	
A12 093	Hollow screw pipe union	M14x1.5	Ring piece, pipe 10mm	TCD 2013		4V	49 Nm	
A12 095	Pipe clip, fastening	M8-8.8		TCD 2013		4V	20 Nm	
A13 001	Starter on crankcase	M10x38		TCD 2013		4V	60 Nm	
A13 007	Shielding plate on starter	M6		TCD 2013		4V	13 Nm	
A13 010	Console for 2nd generator on crankcase	M10x80	Collared head bolt	TCD 2013		4V	60 Nm	
A13 012	Generator on holder	M10x100		TCD 2013		4V	60 Nm	
A13 014	Holder on console for generator (operating side)	M8x20		TCD 2013		4V	30 Nm	
A13 021	Belt pulley on generator shaft	M17x1.5		TCD 2013		4V	98 - 137 Nm	
A13 037	Cable connection on pre-heating relay	M6	Cl. 30 and 50i	TCD 2013		4V	4 Nm	
A13 038	Cable connection on pre-heating relay	M4	Cl. 50 and 85	TCD 2013		4V	1.5 Nm	
A13 041	Cable rail on rocker arm brackets	M6	Hexagon socket head	TCD 2013		4V	8.5 Nm	

ID no.	Name	Screw type	Notes / Remarks	Series			Pre-clam- ping value	Post- clamping value
A13 046	Pressure/temperature sensor on charge air line			TCD 2013		4V	7.5 Nm	
A13 051	Cable connection on injector			TCD 2013		4V	1.5 Nm	
A13 064	Slotted nut for cable plug	M28		TCD 2013		4V	9 Nm	
A13 064	Plastic nut for cable plug	M28		TCD 2013		4V	6 Nm	
A13 065	Cable connection on heating flange			TCD 2013		4V	20 Nm	
A13 071	Charge current cable on starter			TCD 2013		4V	15 Nm	
A13 073	Cable connection on starter relay			TCD 2013		4V	2.5 Nm	
A13 081	Charge current cable on generator B+			TCD 2013		4V	12 Nm	
A13 082	Cable D+ on generator			TCD 2013		4V	3 Nm	



## **5 Job card overview**

### **5.1 Sorted alphabetically**





Activity	Job card	Maintenance group
Checking and setting the valve clearance	W 01-01-01	Cylinder head
Checking piston overhang	W 01-04-09	Cylinder head
Checking the axial clearance of the crankshaft	W 02-01-04	Drive system
Checking the camshaft	W 04-05-06	Engine control
Checking the compression pressure	W 00-02-06	General
Checking the crankshaft	W 02-01-07	Drive system
Checking the overhang of the cylinder liner	W 03-03-08	Crankcase
Checking the piston	W 02-09-07	Drive system
Checking the piston rings and piston ring grooves	W 02-10-03	Drive system
Checking the valve guide	W 01-06-03	Cylinder head
Checking the valve lag	W 01-07-08	Cylinder head
Checking the valves	W 01-05-04	Cylinder head
Dismantling and assembling the crankcase breather	W 03-01-15	Crankcase
Dismantling and assembling the valve control	W 01-02-06	Cylinder head
Mounting engine on assembly block and demounting	W 00-05-01	General
Removing and installing pressure sensor/temperature sensor (charge air)	W 13-08-01	Electrical system
Removing and installing temperature transmitter	W 09-12-01	Cooling system
Removing and installing the actuator (exhaust gas return)	W 06-09-05	Exhaust system / Charging
Removing and installing the air conditioning compressor	W 12-10-01	Other components
Removing and installing the camshaft	W 04-05-05	Engine control
Removing and installing the charge air line	W 06-02-03	Exhaust system / Charging
Removing and installing the connection housing	W 03-09-04	Crankcase
Removing and installing the control block	W 07-15-01	Fuel system
Removing and installing the coolant pump	W 09-07-08	Cooling system
Removing and installing the cooler (exhaust gas return)	W 06-09-04	Exhaust system / Charging
Removing and installing the crankcase bleeding	W 03-01-11	Crankcase
Removing and installing the crankshaft	W 02-04-01	Drive system
Removing and installing the cylinder head	W 01-04-04	Cylinder head
Removing and installing the cylinder liner	W 03-03-02	Crankcase
Removing and installing the exhaust line	W 06-01-05	Exhaust system / Charging
Removing and installing the flutter valve (exhaust gas return)	W 06-09-03	Exhaust system / Charging
Removing and installing the flywheel	W 12-06-01	Other components

Activity	Job card	Maintenance group
Removing and installing the front cover (opposite side to flywheel)	<a href="#">W 03-08-01</a>	Crankcase
Removing and installing the fuel pressure sensor	<a href="#">W 07-15-18</a>	Fuel system
Removing and installing the fuel supply pump	<a href="#">W 07-11-01</a>	Fuel system
Removing and installing the gearcase	<a href="#">W 04-04-10</a>	Crankcase
Removing and installing the generator (operating side)	<a href="#">W 13-02-03</a>	Electrical system
Removing and installing the generator (outlet side)	<a href="#">W 13-02-05</a>	Electrical system
Removing and installing the heating flange	<a href="#">W 06-02-08</a>	Exhaust system / Charging
Removing and installing the high-pressure pump (installation position A)	<a href="#">W 07-15-04</a>	Fuel system
Removing and installing the high-pressure pump (installation position B)	<a href="#">W 07-15-05</a>	Fuel system
Removing and installing the impulse transmitter (camshaft)	<a href="#">W 05-07-03</a>	Speed governing
Removing and installing the impulse transmitter (crankshaft)	<a href="#">W 05-07-01</a>	Speed governing
Removing and installing the injector	<a href="#">W 07-15-11</a>	Fuel system
Removing and installing the lubricating oil pan (heavy duty version)	<a href="#">W 08-04-07</a>	Lube oil system
Removing and installing the oil cooler	<a href="#">W 08-08-02</a>	Lube oil system
Removing and installing the oil cooler housing	<a href="#">W 08-08-03</a>	Lube oil system
Removing and installing the oil pressure switch	<a href="#">W 08-11-08</a>	Lube oil system
Removing and installing the piston and con rod	<a href="#">W 02-09-03</a>	Drive system
Removing and installing the pressure limiting valve	<a href="#">W 07-15-14</a>	Fuel system
Removing and installing the rail	<a href="#">W 07-15-08</a>	Fuel system
Removing and installing the rail pressure sensor	<a href="#">W 07-15-16</a>	Fuel system
Removing and installing the shutoff valve (exhaust gas return)	<a href="#">W 06-09-06</a>	Exhaust system / Charging
Removing and installing the starter	<a href="#">W 13-03-02</a>	Electrical system
Removing and installing the thermostat	<a href="#">W 09-08-02</a>	Cooling system
Removing and installing the thermostat housing	<a href="#">W 09-08-04</a>	Cooling system
Removing and installing the turbocharger	<a href="#">W 06-06-04</a>	Exhaust system / Charging
Removing and installing the valve control	<a href="#">W 01-02-02</a>	Cylinder head
Removing and installing the valves	<a href="#">W 01-05-01</a>	Cylinder head
Removing and installing torsional vibration damper	<a href="#">W 12-01-04</a>	Other components
Renewing the crankshaft sealing ring (flywheel side)	<a href="#">W 02-02-02</a>	Drive system
Renewing the crankshaft sealing ring (opposite side to flywheel)	<a href="#">W 02-02-04</a>	Drive system



Activity	Job card	Maintenance group
Testing the cylinder liner	<a href="#">W 03-03-01</a>	Crankcase



## **5.2 Sorted numerically**



Job card	Activity	Maintenance group
W 00-02-06	Checking the compression pressure	General
W 00-05-01	Mounting engine on assembly block and demounting	General
W 01-01-01	Checking and setting the valve clearance	Cylinder head
W 01-02-02	Removing and installing the valve control	Cylinder head
W 01-02-06	Dismantling and assembling the valve control	Cylinder head
W 01-04-04	Removing and installing the cylinder head	Cylinder head
W 01-04-09	Checking piston overhang	Cylinder head
W 01-05-01	Removing and installing the valves	Cylinder head
W 01-05-04	Checking the valves	Cylinder head
W 01-06-03	Checking the valve guide	Cylinder head
W 01-07-08	Checking the valve lag	Cylinder head
W 02-01-04	Checking the axial clearance of the crankshaft	Drive system
W 02-01-07	Checking the crankshaft	Drive system
W 02-02-02	Renewing the crankshaft sealing ring (flywheel side)	Drive system
W 02-02-04	Renewing the crankshaft sealing ring (opposite side to flywheel)	Drive system
W 02-04-01	Removing and installing the crankshaft	Drive system
W 02-09-03	Removing and installing the piston and con rod	Drive system
W 02-09-07	Checking the piston	Drive system
W 02-10-03	Checking the piston rings and piston ring grooves	Drive system
W 03-01-11	Removing and installing the crankcase bleeding	Crankcase
W 03-01-15	Dismantling and assembling the crankcase breather	Crankcase
W 03-03-01	Testing the cylinder liner	Crankcase
W 03-03-02	Removing and installing the cylinder liner	Crankcase
W 03-03-08	Checking the overhang of the cylinder liner	Crankcase
W 03-08-01	Removing and installing the front cover (opposite side to flywheel)	Crankcase
W 03-09-04	Removing and installing the connection housing	Crankcase
W 04-04-10	Removing and installing the gearcase	Crankcase
W 04-05-05	Removing and installing the camshaft	Engine control
W 04-05-06	Checking the camshaft	Engine control
W 05-07-01	Removing and installing the impulse transmitter (crankshaft)	Speed governing
W 05-07-03	Removing and installing the impulse transmitter (camshaft)	Speed governing
W 06-01-05	Removing and installing the exhaust line	Exhaust system / Charging

Job card	Activity	Maintenance group
W 06-02-03	Removing and installing the charge air line	Exhaust system / Charging
W 06-02-08	Removing and installing the heating flange	Exhaust system / Charging
W 06-06-04	Removing and installing the turbocharger	Exhaust system / Charging
W 06-09-03	Removing and installing the flutter valve (exhaust gas return)	Exhaust system / Charging
W 06-09-04	Removing and installing the cooler (exhaust gas return)	Exhaust system / Charging
W 06-09-05	Removing and installing the actuator (exhaust gas return)	Exhaust system / Charging
W 06-09-06	Removing and installing the shutoff valve (exhaust gas return)	Exhaust system / Charging
W 07-11-01	Removing and installing the fuel supply pump	Fuel system
W 07-15-01	Removing and installing the control block	Fuel system
W 07-15-04	Removing and installing the high-pressure pump (installation position A)	Fuel system
W 07-15-05	Removing and installing the high-pressure pump (installation position B)	Fuel system
W 07-15-08	Removing and installing the rail	Fuel system
W 07-15-11	Removing and installing the injector	Fuel system
W 07-15-14	Removing and installing the pressure limiting valve	Fuel system
W 07-15-16	Removing and installing the rail pressure sensor	Fuel system
W 07-15-18	Removing and installing the fuel pressure sensor	Fuel system
W 08-04-07	Removing and installing the lubricating oil pan (heavy duty version)	Lube oil system
W 08-08-02	Removing and installing the oil cooler	Lube oil system
W 08-08-03	Removing and installing the oil cooler housing	Lube oil system
W 08-11-08	Removing and installing the oil pressure switch	Lube oil system
W 09-07-08	Removing and installing the coolant pump	Cooling system
W 09-08-02	Removing and installing the thermostat	Cooling system
W 09-08-04	Removing and installing the thermostat housing	Cooling system
W 09-12-01	Removing and installing temperature transmitter	Cooling system
W 12-01-04	Removing and installing torsional vibration damper	Other components
W 12-06-01	Removing and installing the flywheel	Other components
W 12-10-01	Removing and installing the air conditioning compressor	Other components
W 13-02-03	Removing and installing the generator (operating side)	Electrical system
W 13-02-05	Removing and installing the generator (outlet side)	Electrical system
W 13-03-02	Removing and installing the starter	Electrical system



Job card	Activity	Maintenance group
W 13-08-01	Removing and installing pressure sensor/temperature sensor (charge air)	Electrical system



### **5.3 Job card references**



## 00 General

Job card	Activity and additional job cards necessary for its execution				
W 00-02-06	Checking the compression pressure				
	W 01-01-01	W 07-11-01	W 07-15-11		
W 00-05-01	Mounting engine on assembly block and demounting				

## 01 Cylinder head

Job card	Activity and additional job cards necessary for its execution				
W 01-01-01	Checking and setting the valve clearance				
W 01-02-02	Removing and installing the valve control				
	W 01-01-01	W 01-02-06			
W 01-02-06	Dismantling and assembling the valve control				
	W 01-02-02				
W 01-04-04	Removing and installing the cylinder head				
	W 01-02-02	W 01-04-09	W 01-07-08	W 06-01-05	W 06-02-03
W 01-04-09	Checking piston overhang				
	W 01-04-04				
W 01-05-01	Removing and installing the valves				
	W 01-04-04	W 07-15-11			
W 01-05-04	Checking the valves				
	W 01-05-01				
W 01-06-03	Checking the valve guide				
	W 01-05-01				
W 01-07-08	Checking the valve lag				
	W 01-04-04				

## 02 Drive system

Job card	Activity and additional job cards necessary for its execution				
W 02-01-04	Checking the axial clearance of the crankshaft				
W 02-01-07	Checking the crankshaft				
	W 02-04-01				
W 02-02-02	Renewing the crankshaft sealing ring (flywheel side)				
	W 12-06-01				

## 02 Drive system (Forts.)

Job card	Activity and additional job cards necessary for its execution				
W 02-02-04	Renewing the crankshaft sealing ring (opposite side to flywheel)				
	W 12-01-04				
W 02-04-01	Removing and installing the crankshaft				
	W 02-01-04	W 02-09-03	W 03-08-01	W 04-04-10	
W 02-09-03	Removing and installing the piston and con rod				
	W 01-04-04	W 08-04-07			
W 02-09-07	Checking the piston				
	W 02-09-03				
W 02-10-03	Checking the piston rings and piston ring grooves				
	W 02-09-03				

## 03 Crankcase

Job card	Activity and additional job cards necessary for its execution				
W 03-01-11	Removing and installing the crankcase bleeding				
W 03-01-15	Dismantling and assembling the crankcase breather				
W 03-03-01	Testing the cylinder liner				
	W 01-04-04	W 02-09-03			
W 03-03-02	Removing and installing the cylinder liner				
	W 02-09-03	W 03-03-08			
W 03-03-08	Checking the overhang of the cylinder liner				
	W 01-04-04				
W 03-08-01	Removing and installing the front cover (opposite side to flywheel)				
	W 02-02-04	W 08-04-07	W 12-01-04		
W 03-09-04	Removing and installing the connection housing				
	W 05-07-01	W 12-06-01	W 13-03-02		
W 04-04-10	Removing and installing the gearcase				
	W 02-02-02	W 03-09-04	W 05-07-03	W 07-11-01	W 08-04-07
	W 12-06-01	W 13-03-02			

## 04 Engine control

Job card	Activity and additional job cards necessary for its execution				
W 04-05-05	Removing and installing the camshaft				
	W 02-04-01	W 07-15-04	W 07-15-05		

## 04 Engine control (Forts.)

Job card	Activity and additional job cards necessary for its execution				
W 04-05-06	Checking the camshaft				
	W 04-05-05				

## 05 Speed governing

Job card	Activity and additional job cards necessary for its execution				
W 05-07-01	Removing and installing the impulse transmitter (crankshaft)				
W 05-07-03	Removing and installing the impulse transmitter (camshaft)				

## 06 Exhaust system / Charging

Job card	Activity and additional job cards necessary for its execution				
W 06-01-05	Removing and installing the exhaust line				
	W 06-06-04				
W 06-02-03	Removing and installing the charge air line				
	W 06-09-04	W 06-09-05			
W 06-02-08	Removing and installing the heating flange				
	W 06-09-03				
W 06-06-04	Removing and installing the turbocharger				
W 06-09-03	Removing and installing the flutter valve (exhaust gas return)				
W 06-09-04	Removing and installing the cooler (exhaust gas return)				
	W 06-09-03	W 06-09-06			
W 06-09-05	Removing and installing the actuator (exhaust gas return)				
W 06-09-06	Removing and installing the shutoff valve (exhaust gas return)				

## 07 Fuel system

Job card	Activity and additional job cards necessary for its execution				
W 07-11-01	Removing and installing the fuel supply pump				
	User notes				

## 07 Fuel system (Forts.)

Job card	Activity and additional job cards necessary for its execution			
W 07-15-01	Removing and installing the control block			
	User notes			
W 07-15-04	Removing and installing the high-pressure pump (installation position A)			
	User notes			
W 07-15-05	Removing and installing the high-pressure pump (installation position B)			
	User notes	W 03-01-11		
W 07-15-08	Removing and installing the rail			
	User notes	W 03-01-11		
W 07-15-11	Removing and installing the injector			
	User notes	W 03-01-11		
W 07-15-14	Removing and installing the pressure limiting valve			
	User notes			
W 07-15-16	Removing and installing the rail pressure sensor			
	User notes			
W 07-15-18	Removing and installing the fuel pressure sensor			
	User notes			

## 08 Lube oil system

Job card	Activity and additional job cards necessary for its execution			
W 08-04-07	Removing and installing the lubricating oil pan (heavy duty version)			
W 08-08-02	Removing and installing the oil cooler			
	W 08-08-03			
W 08-08-03	Removing and installing the oil cooler housing			
	User notes			
W 08-11-08	Removing and installing the oil pressure switch			
	User notes			

## 09 Cooling system

Job card	Activity and additional job cards necessary for its execution			
W 09-07-08	Removing and installing the coolant pump			
	W 13-02-03	Operating Manual		
W 09-08-02	Removing and installing the thermostat			
	Operating Manual			



## 09 Cooling system (Forts.)

Job card	Activity and additional job cards necessary for its execution			
W 09-08-04	Removing and installing the thermostat housing			
	Operating Manual			
W 09-12-01	Removing and installing temperature transmitter			

## 12 Other components

Job card	Activity and additional job cards necessary for its execution			
W 12-01-04	Removing and installing torsional vibration damper			
	Operating Manual			
W 12-06-01	Removing and installing the flywheel			
W 12-10-01	Removing and installing the air conditioning compressor			
	Operating Manual			

## 13 Electrical system

Job card	Activity and additional job cards necessary for its execution			
W 13-02-03	Removing and installing the generator (operating side)			
	Operating Manual			
W 13-02-05	Removing and installing the generator (outlet side)			
	Operating Manual			
W 13-03-02	Removing and installing the starter			
W 13-08-01	Removing and installing pressure sensor/temperature sensor (charge air)			





**6 Job cards**



## Checking the compression pressure



Commercial available tools:

- Compression pressure tester..... 8005

Special tools:

- Connector..... 100180



- W 01-01-01
- W 07-11-01
- W 07-15-11

## Checking the compression pressure

- Check and set valve clearance.

 W 01-01-01

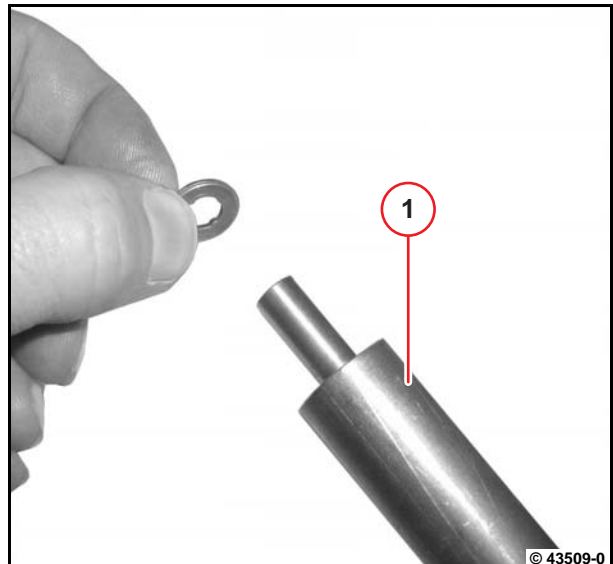
- Remove injectors.

 W 07-15-11

- Insert connector (1).

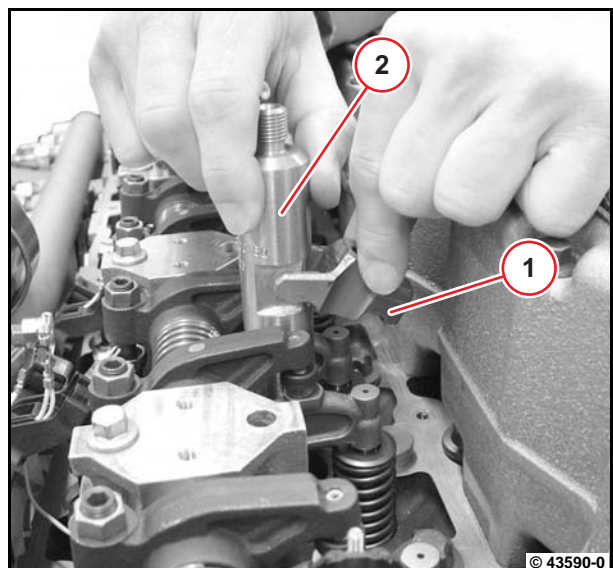


Use sealing ring for injector.

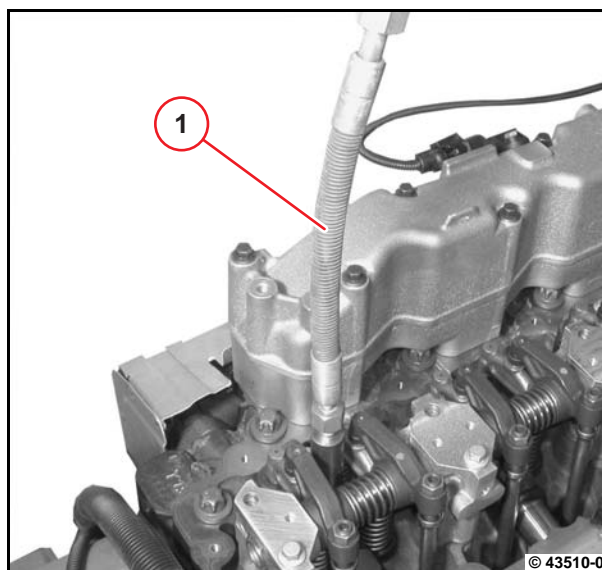


- Place clamping claw (1) on bulge of connection piece (2).
- Insert connection piece (2) and clamping claw (1).
- Tighten connection piece (2) with clamping claw (1).

 A07 001



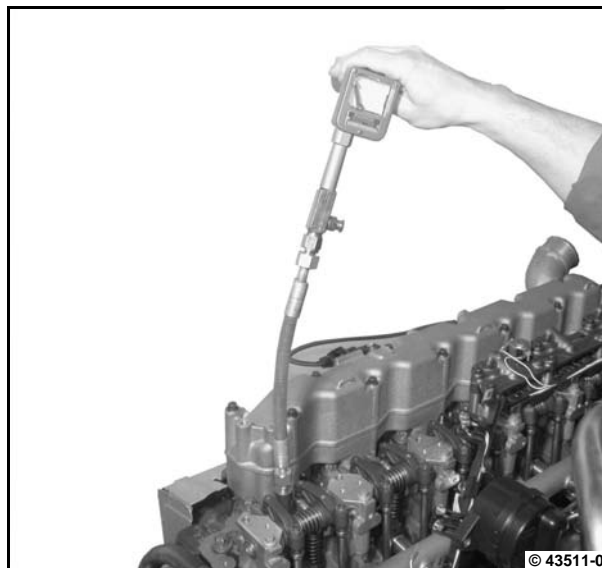
- Connect adapter (1) to connector.



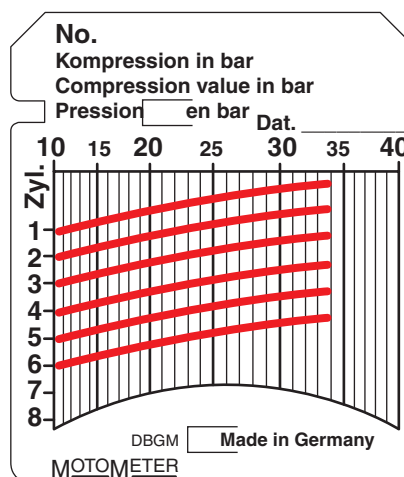
- Connect compression pressure tester to connector.
- Remove fuel supply pump.

 [W 07-11-01](#)

- Turn over engine with starter.



The measured compression pressure depends on the starting speed during the measuring process and the altitude of the engine installation site. Therefore, limit values cannot be determined exactly. The compression pressure measurement is only recommended as a reference measurement of all cylinders of an engine to each other. If more than 15% deviation has been determined, the cause should be determined by disassembling the cylinder unit concerned.



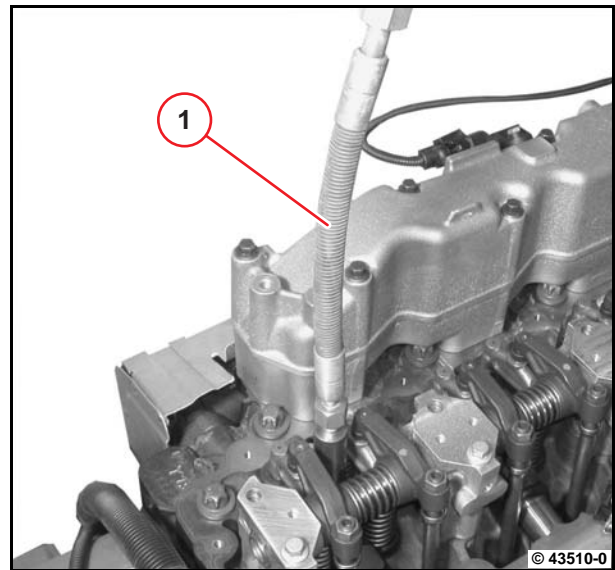
© 33771-5

- Remove the compression pressure tester and adapter (1).
- Remove sealing ring.
- Install the injectors.

 [W 07-15-11](#)

- Install fuel pump.

 [W 07-11-01](#)







## Mounting engine on assembly block and demounting



Commercial available tools

Special tools:

- Assembly block incl. adapter plates . . . . . 6066
- Clamping bracket . . . . . 6066/210
- Engine lifting device . . . . . 6068

6

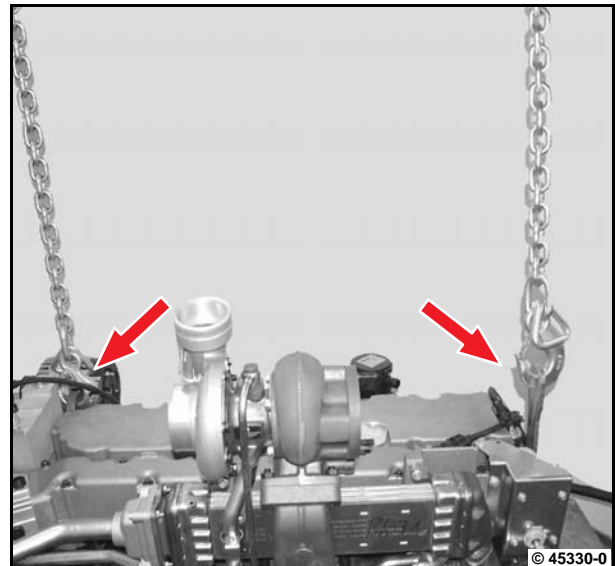
### Mounting engine on assembly block

- Hook the carrying chain in the transportation eyelets (arrows).



P00 04

- Hang engine on workshop crane.
- Insert engine in engine block.



- Mount clamping holder (1).

- Tighten screws (2).

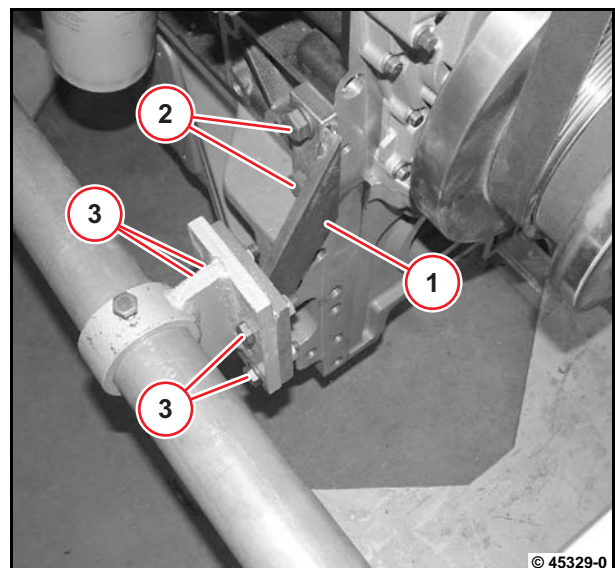




A00 001

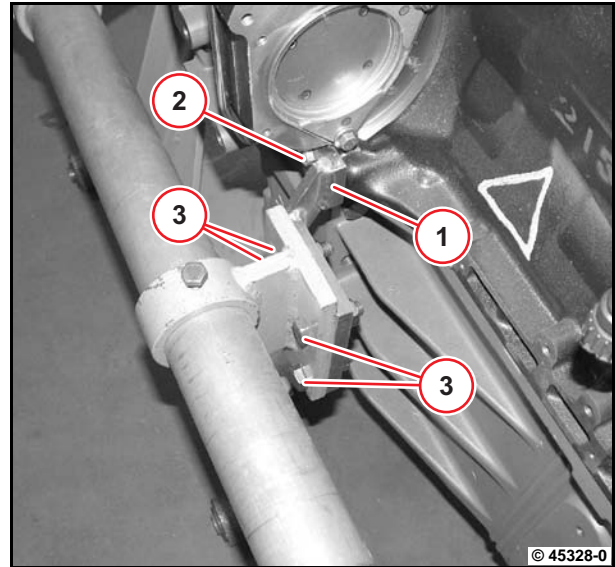
- Tighten screws (3) and lock nuts.





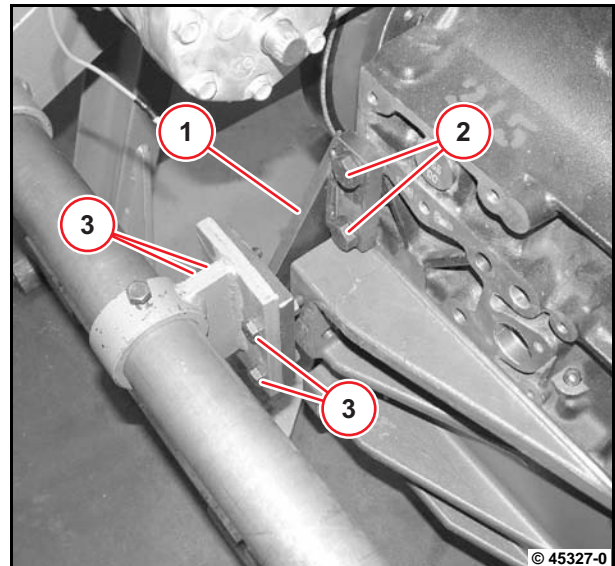
90 Nm





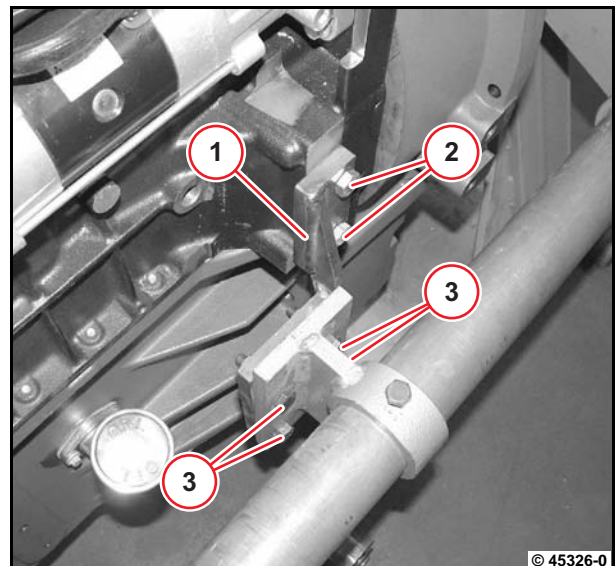
- Mount clamping holder (1).
- Tighten screws (2).
-  A00 001
- Tighten screws(3) and lock nuts.
-  A00 002



- Mount clamping holder (1).
- Tighten screws (2).
-  A00 001
- Tighten screws(3) and lock nuts.
-  A00 002



- Mount clamping holder (1).
- Tighten screws (2).
-  A00 001
- Tighten screws(3) and lock nuts.
-  A00 002
- Unhook engine.



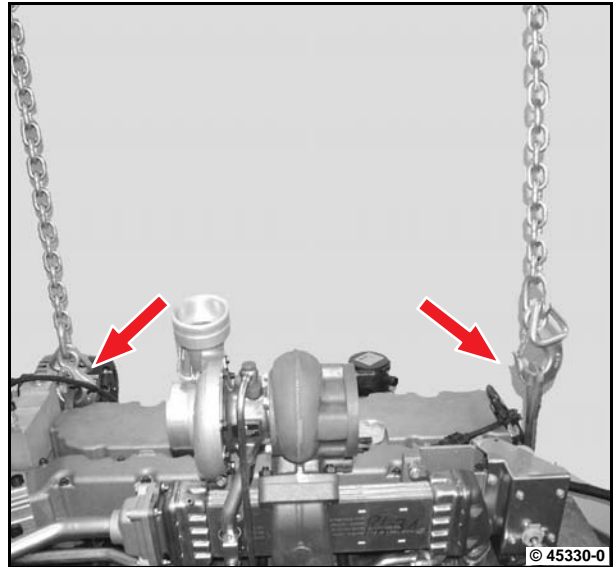
## Demounting engine from assembly block

- Hook the carrying chain in the transportation eyelets (arrows).



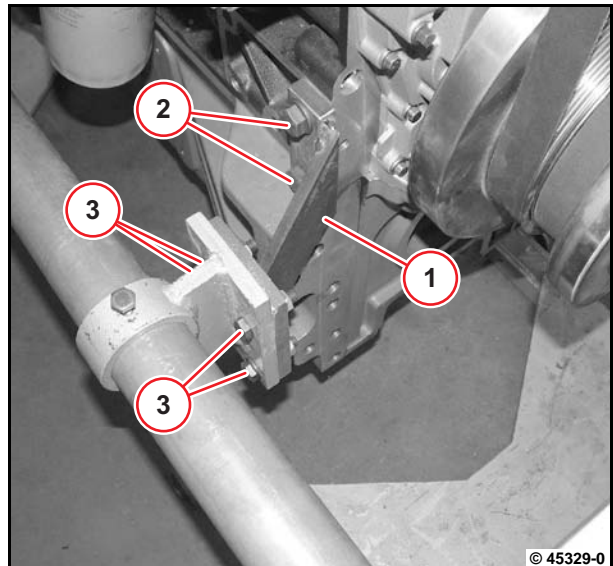
P00 04

- Hang engine on workshop crane.

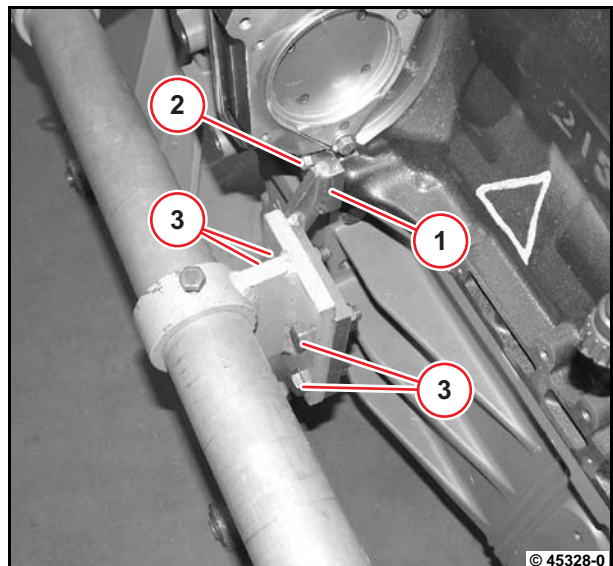


6

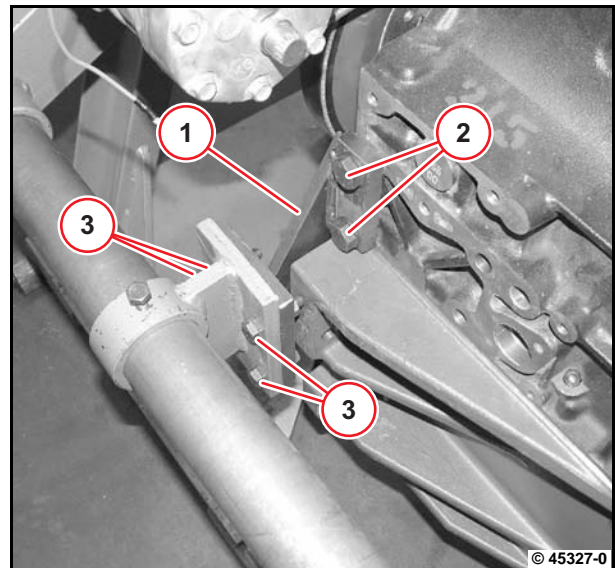
- Loosen lock nuts.
- Remove screws(3) and lock nuts.
- Unscrew screws (2).
- Remove clamping holder (1).



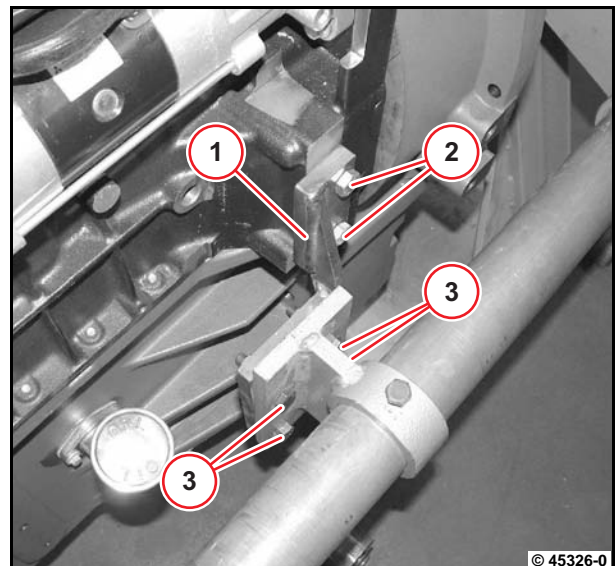
- Loosen lock nuts.
- Remove screws(3) and lock nuts.
- Unscrew screw (2).
- Remove clamping holder (1).



- Loosen lock nuts.
- Remove screws(3) and lock nuts.
- Unscrew screws (2).
- Remove clamping holder (1).



- Loosen lock nuts.
- Remove screws(3) and lock nuts.
- Unscrew screws (2).
- Remove clamping holder (1).
- Set down engine.
- Unhook engine.





## Checking and setting the valve clearance



Commercial available tools:

- Rotation angle disc . . . . . 8190
- Screwdriver insert for hexagon socket head screws (4 mm) . . . . . 8194
- Screwdriver insert for hexagon socket head screws (5 mm) . . . . . 8193
- Open end wrench adapter . . . . . 8196

Special tools:

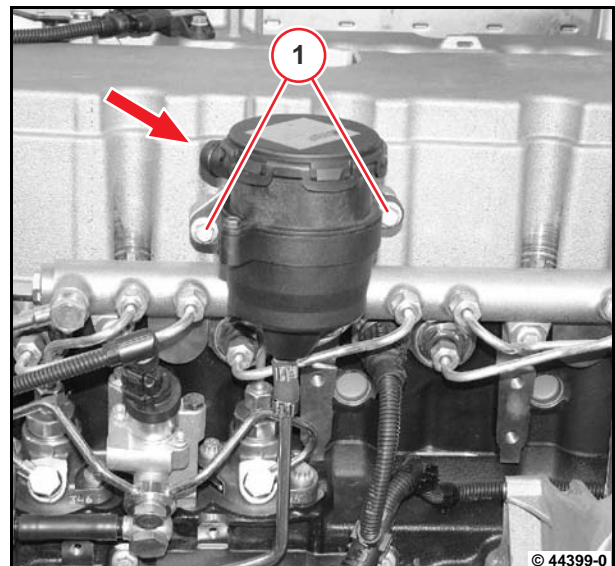
- Turn-over gear . . . . . 100370



Allow the engine to cool down for at least 30 minutes before setting the valve clearance. Engine oil temperature < 80 °C

## Disassembly

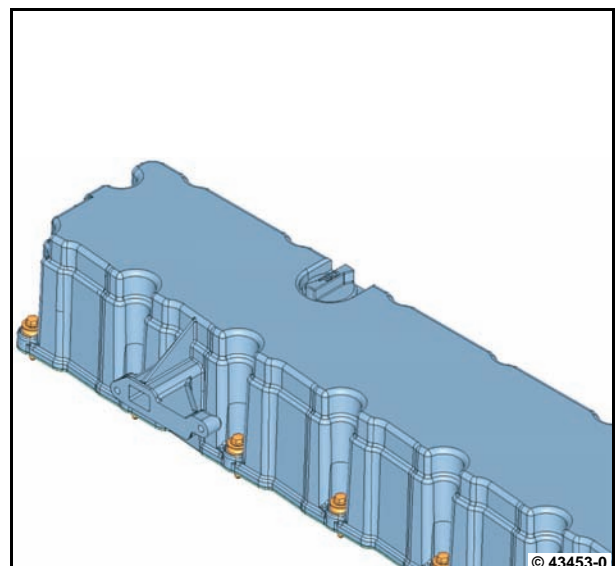
- Unscrew screws (1).
- Remove hose pipe (arrow).



- Remove the cylinder head hood.

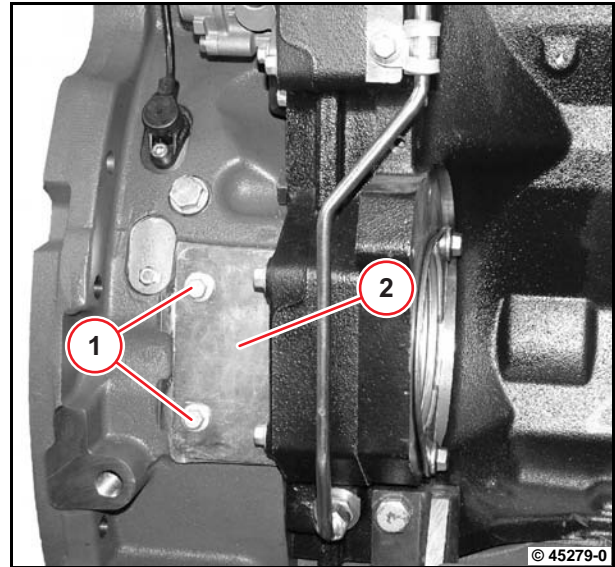


Gasket and screws are captively locked on the cylinder head hood.



## Setting engine to valve overlap

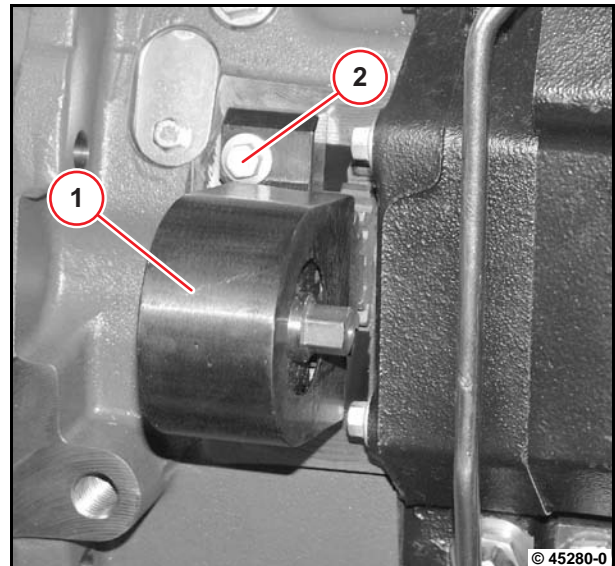
- Unscrew screws (1).
- Remove cover (2).



- Insert turn-over gear (1).
- Tighten screw (2).



A03 085



- Turn crankshaft using the turning gear until the valve overlap of cylinder 1 is reached.



Valve overlap means:

Inlet valves begin to open and exhaust valves close.

Observe valve clearance setting diagram.

– 4-cylinder:

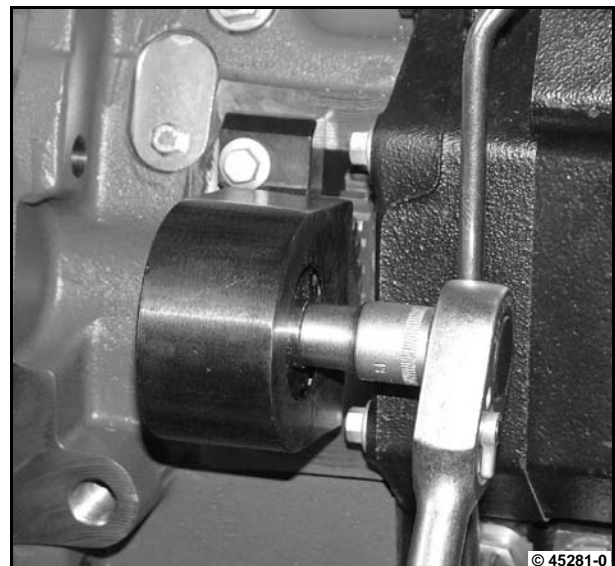


T01 63

– 6-cylinder:



T01 63

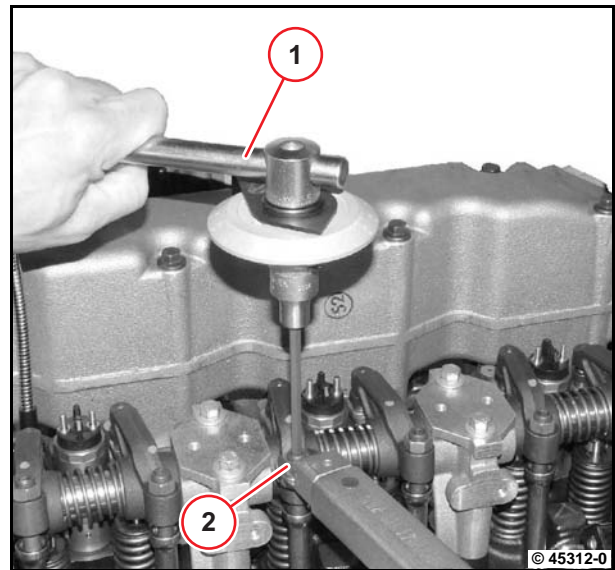


- Fix magnet of rotation angle disc on cylinder head.
- Set the rotation angle disc with a screwdriver insert at the adjusting screw.
- Plug on the tee handle (1).
- Loosen lock nut (2).



Hold with tee handle.

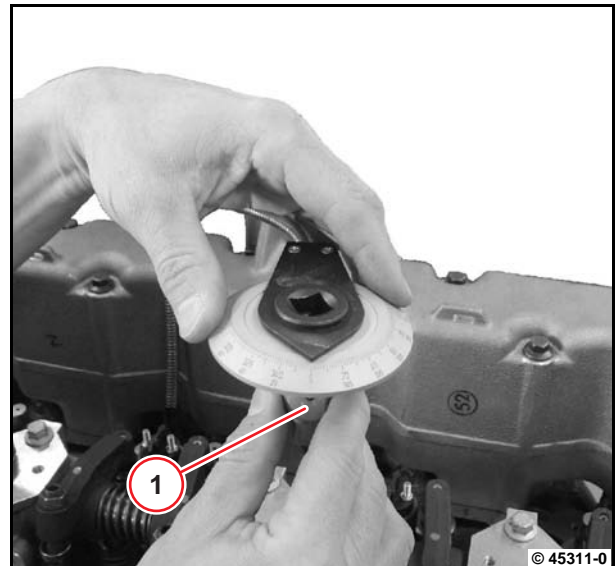
Do not rotate adjusting screw.



6

### Check

- Set rotation angle disc to "0".
- Hold adjusting screw.
- Hold setting screw with screwdriver insert (1).



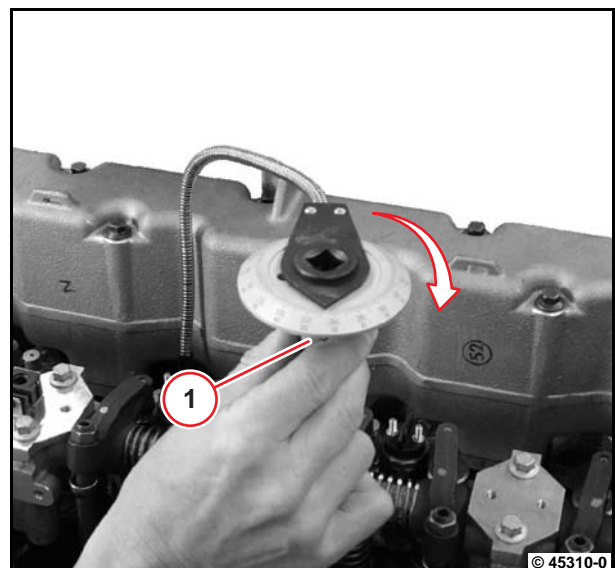
- Turn the setting screw with screwdriver insert (1) in the direction of the arrow until the setting screw is touching without clearance.



If the setting screw is already touching without clearance, there is no valve clearance.

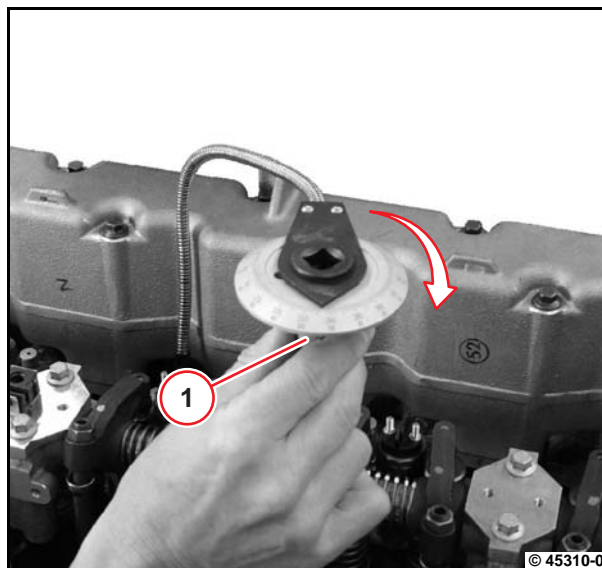
Causes must be eliminated.

- Read the rotation angle degrees from the rotation angle disc.

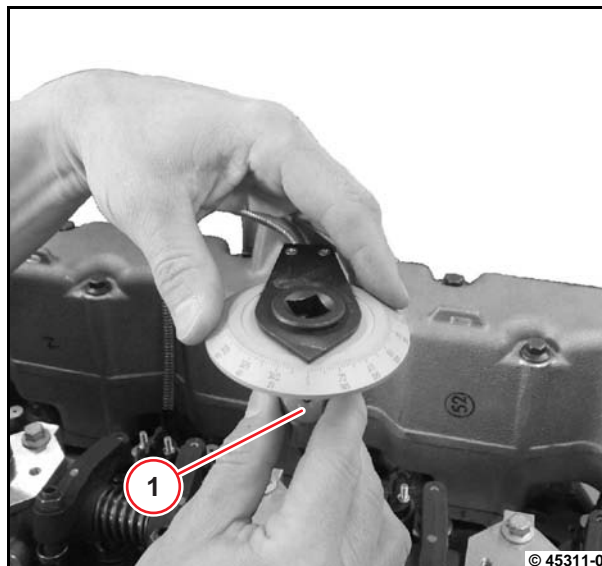


## Settings

- Turn the setting screw with screwdriver insert (1) in the direction of the arrow until the setting screw is touching without clearance.



- Set rotation angle disc to "0".
- Hold setting screw with screwdriver insert (1).

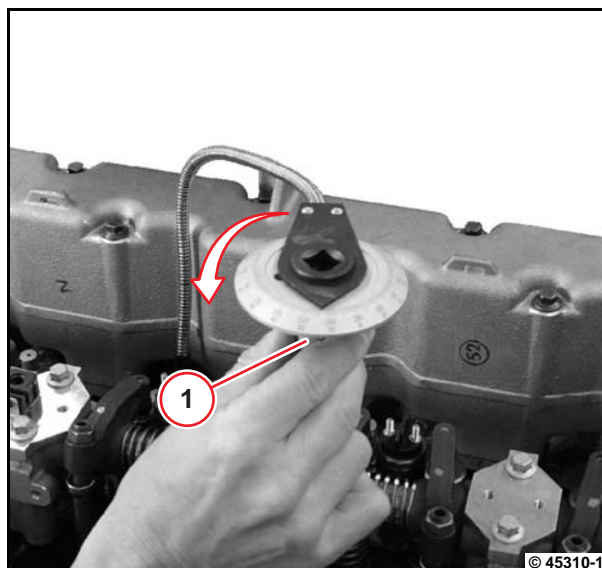


- Turn setting screw back with screwdriver insert (1) until the specified rotation angle is reached.



P01 61

P01 62





- Plug on the tee handle (1).



Hold with tee handle.  
Do not rotate adjusting screw.

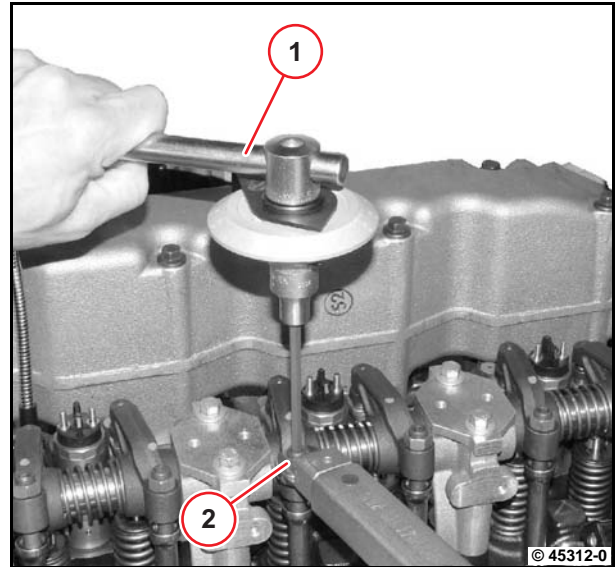
- Tighten lock nut (2) with open wrench.



A01 003



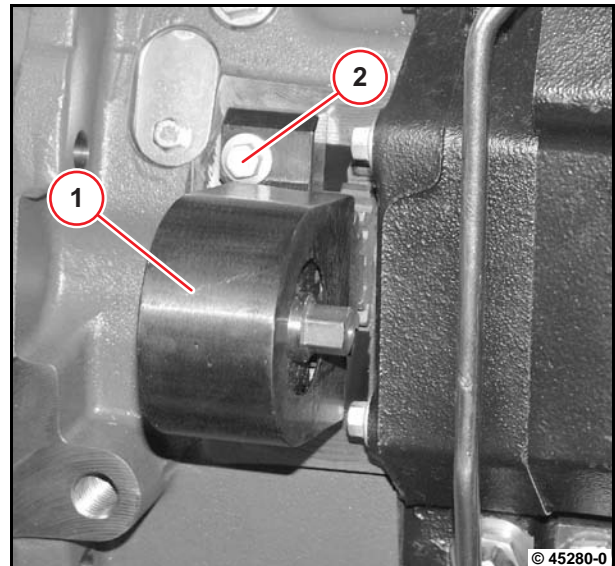
Set all other valves according to the valve setting schematic T01 63.



6

### Assembly

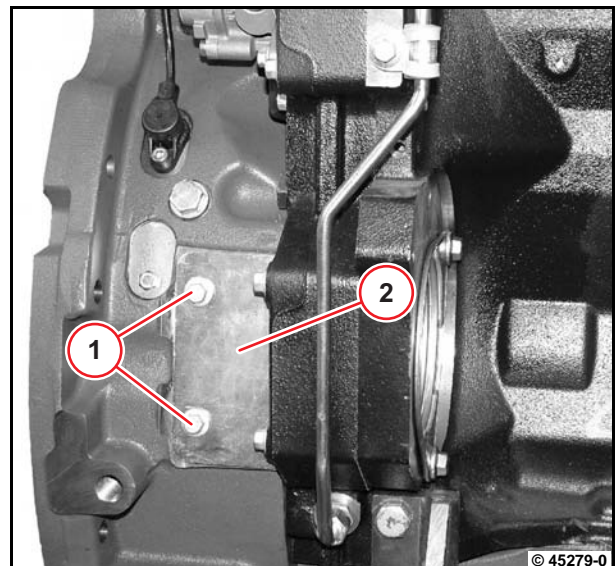
- Unscrew screw (2).
- Remove turning gear (1).



- Mount cover (2).
- Tighten screws (1).



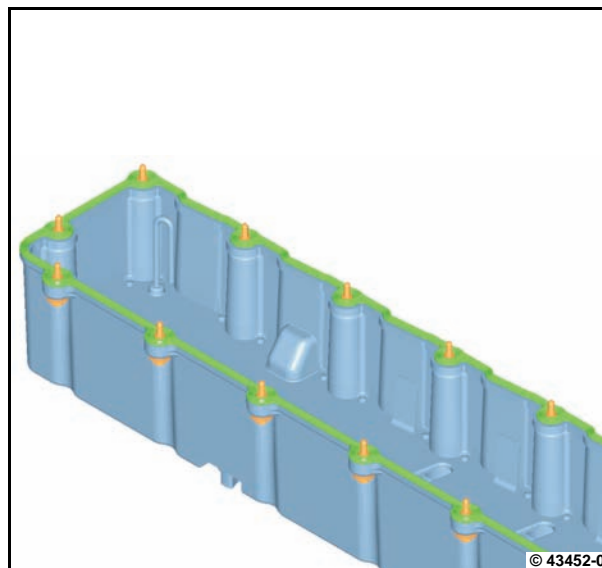
A03 085



- Clean sealing surfaces and gasket of cylinder head cover.



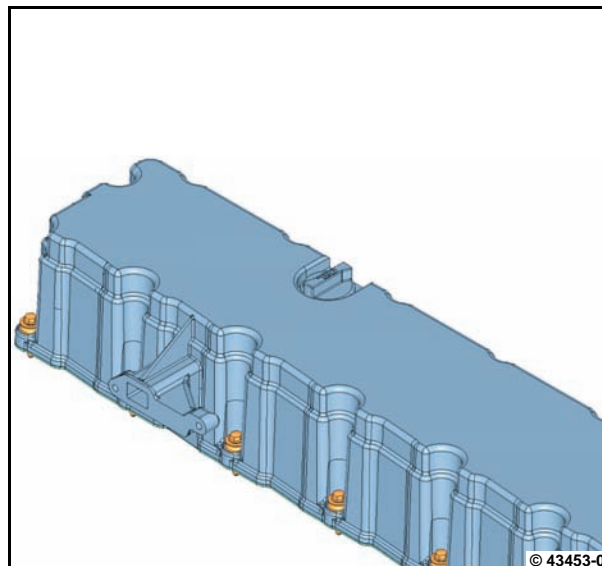
Make sure the gasket fits perfectly.  
The gasket can be reused several times if it is not damaged.



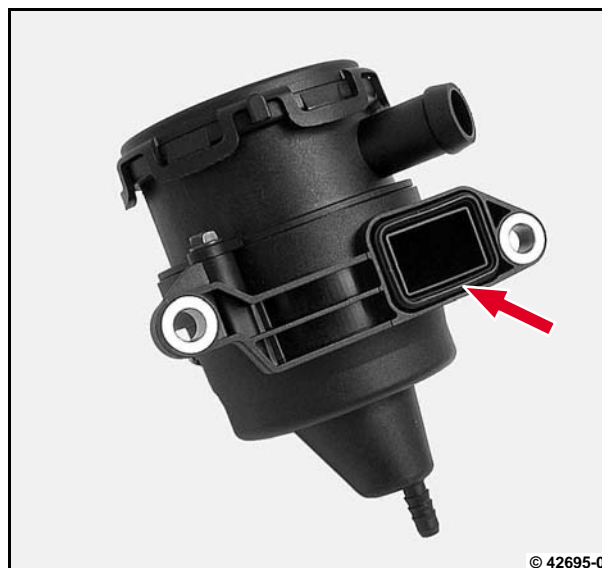
- Mount the cylinder head cover.
- Tighten screws evenly.



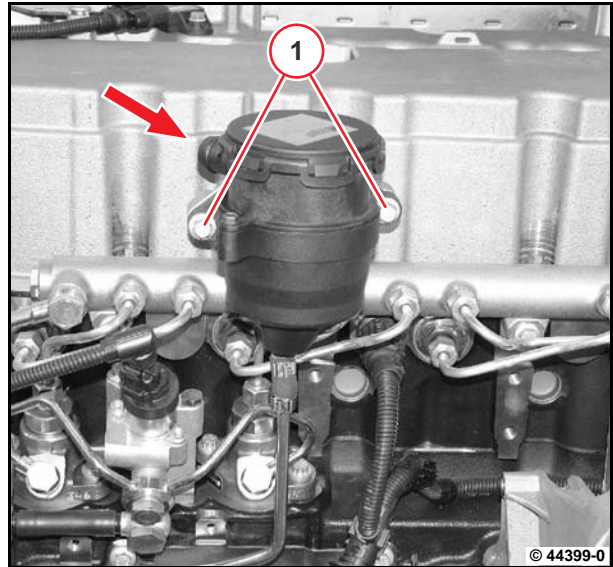
A01 004



- Insert new gasket (arrow).



- Install hose pipe (arrow).
- Tighten screws (1).

 **A03 060**



## Removing and installing the valve control




Commercial available tools:  
– Grooved nut wrench . . . . . 6692

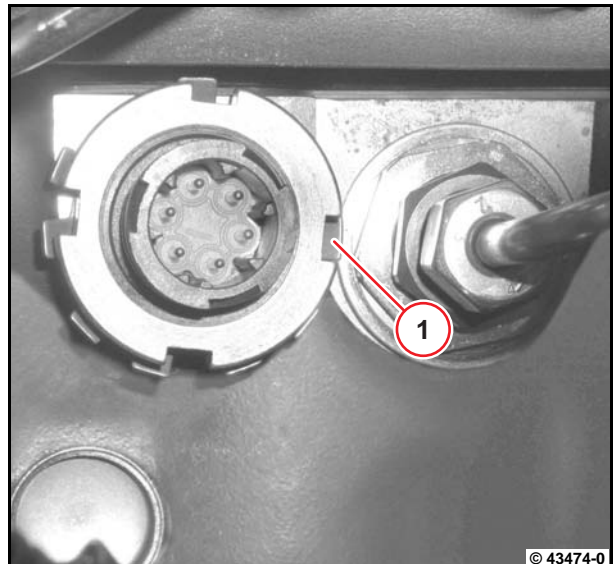


– W 01-01-01  
– W 01-02-06

6

### Removing the valve control

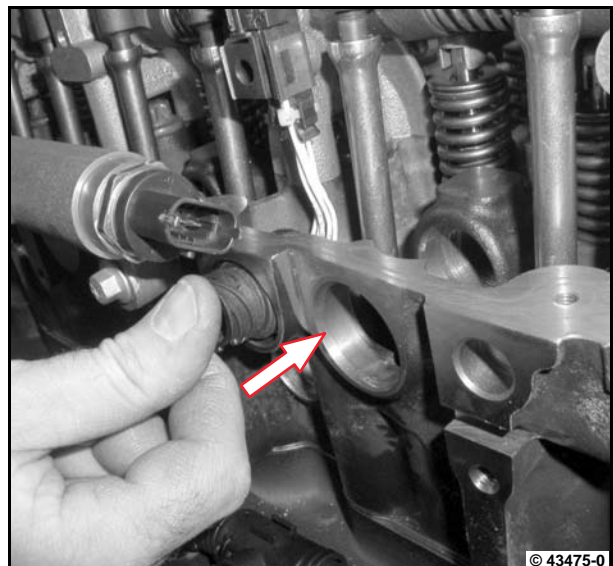
- Remove the cylinder head hood.  
 W 01-01-01
- Bend back the lock latch (1).
- Unscrew the grooved nut with grooved nut wrench.



- Push cable plug inwards in the direction of the arrow.



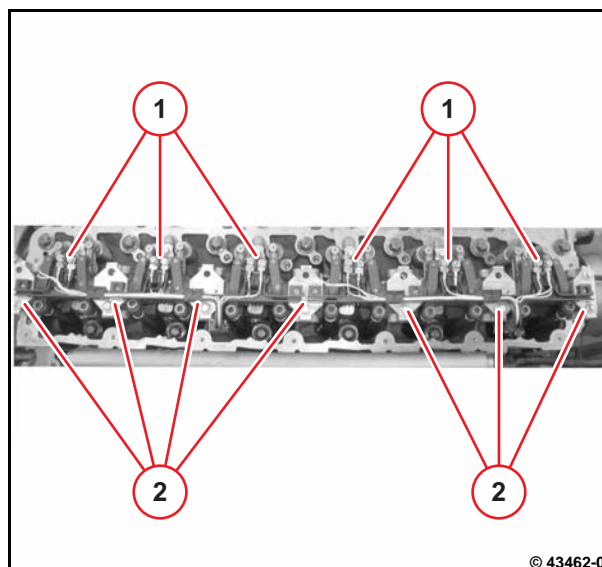
Ensure that the cables do not buckle or get damaged.



- Unscrew cables from the injectors (1).
- Remove rocker arm brackets (2).
- Completely raise rocker arm shaft and remove cable plug from cylinder head.



Pay attention to dowel bushes.



- Remove all valve bridges from valves.



### Installing the valve control

- Remove sealing ring.
- Insert new sealing ring.

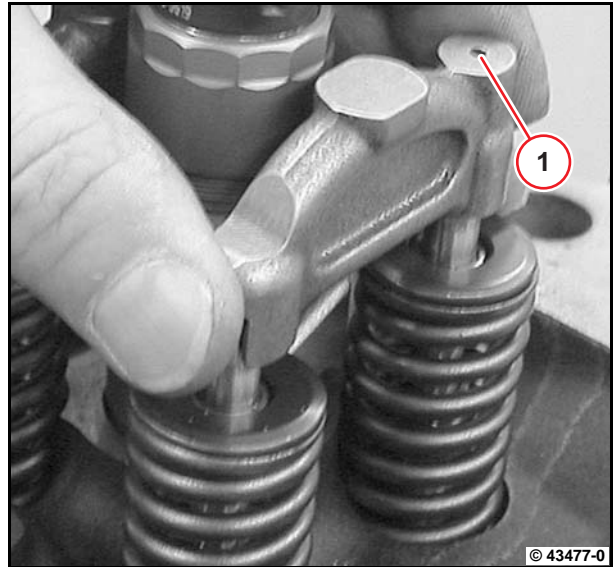




- Put all valve bridges on valves.



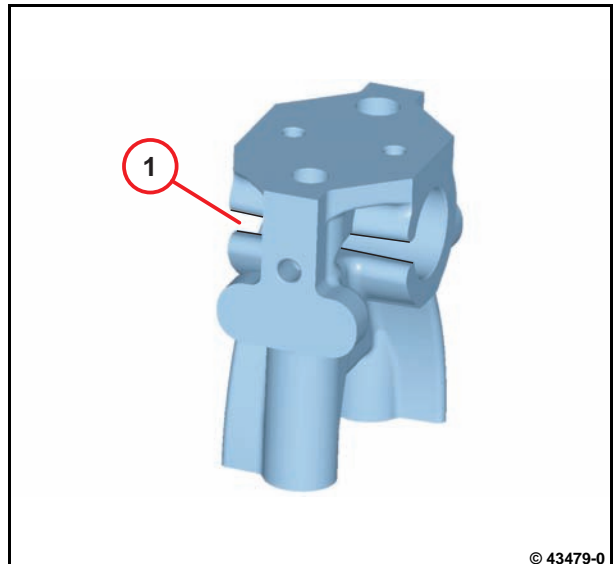
Bore (1) points towards exhaust side.



6



Slot (1) of rocker arm brackets points towards exhaust side.



- Assemble valve control.



W 01-02-06

- Place completed rocker arm shaft on cylinder head.

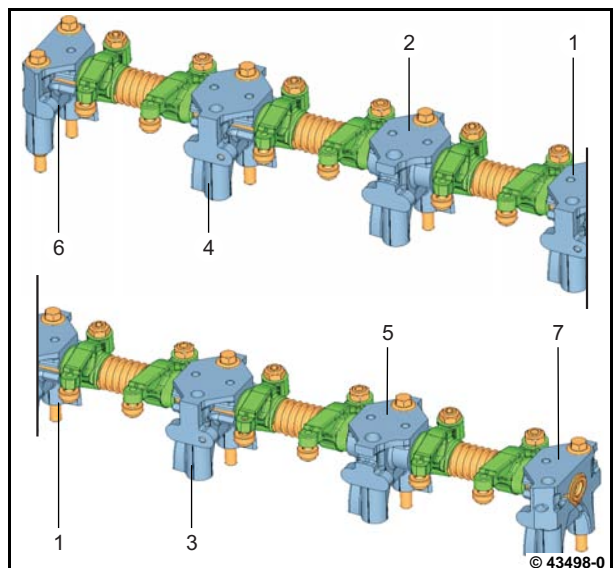


Pay attention to dowel bushes of rocker arm brackets.

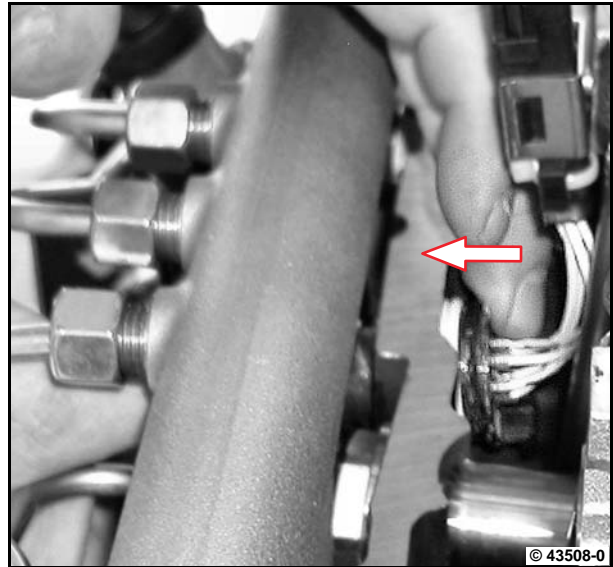
- Tighten rocker arm brackets according to tightening sequence from the centre "1" outwards.



A01 002



- Insert cable plug in cylinder head and press in direction of the arrow.



- Mount new lock washer.
- Tighten the grooved nut with grooved nut wrench.

 A13 064

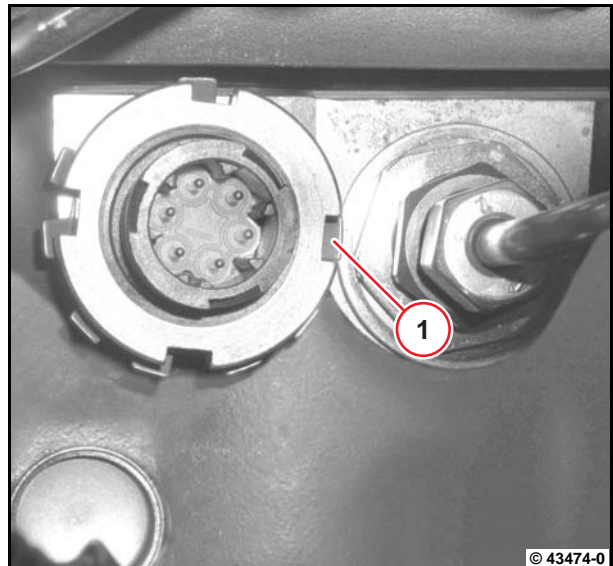
– Plastic nut:

 A13 064



The conical side of the ring nut points towards the cylinder head.  
One groove of the slotted nut must be congruent with a lock latch.

- Bend back lock latch (1) to secure the slotted nut.



- Tighten cable rail on rocker arm brackets (2).

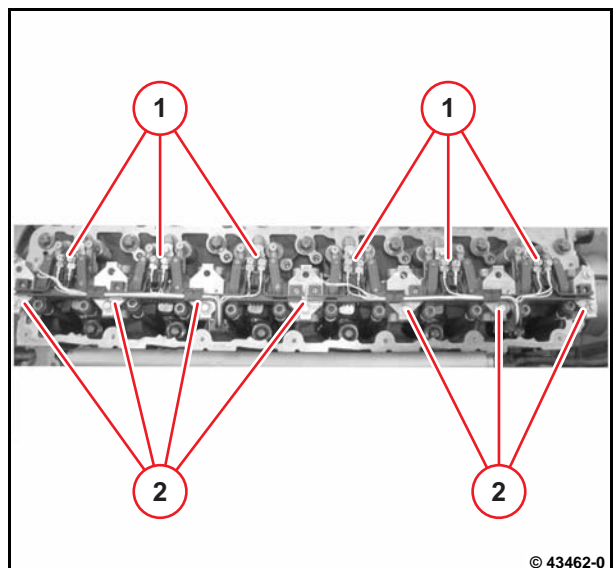
 A13 041

- Screw on cables (1).

 A13 051

- Check and set valve clearance.

 W 01-01-01





## Dismantling and assembling the valve control



Commercial available tools



– W 01-02-02

**6**

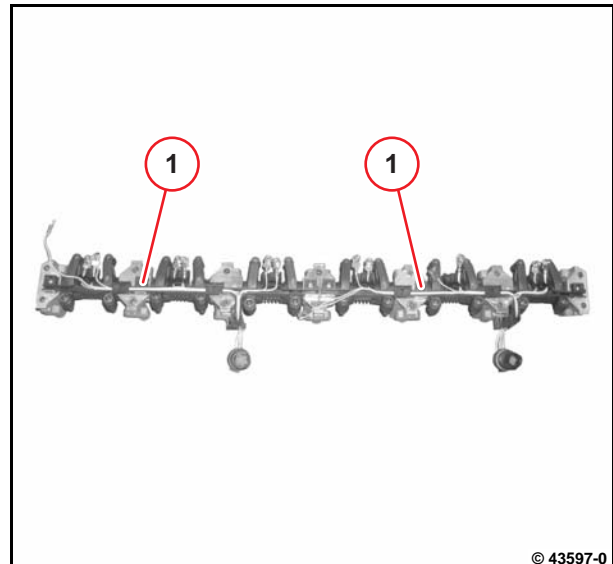
### Dismantling the valve control

- Remove the valve control.

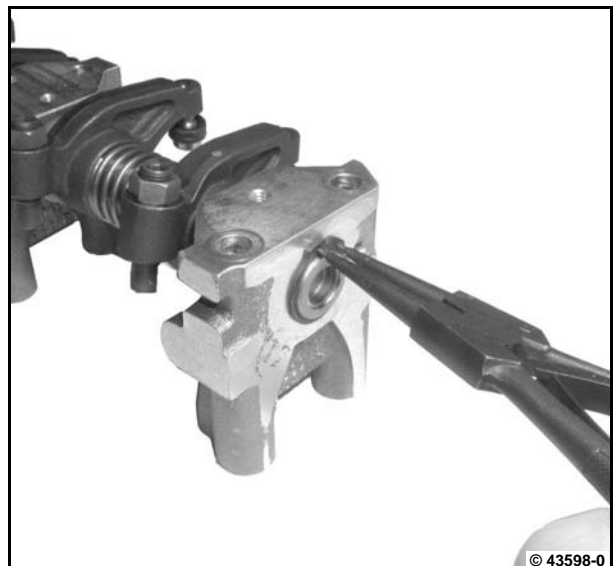


W 01-02-02

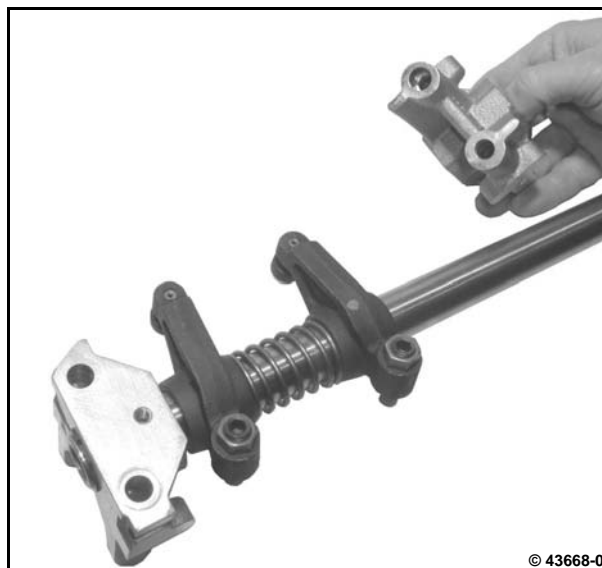
- Remove cable rail (1).



- Remove locking ring.



- Remove rocker arm bracket and rocker arm from rocker arm shaft.
- Put aside components in the order in which they were removed.
- Remove locking ring.
- Check components for visible signs of wear.



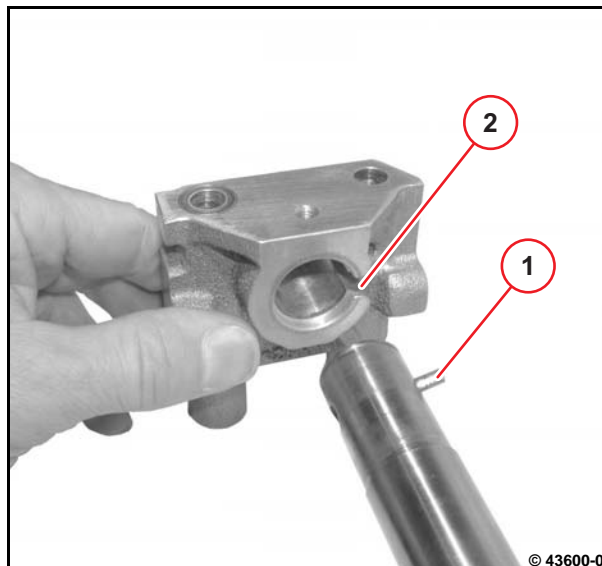
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### Assembling the valve control

- Push the outer rocker arm bracket (flywheel side) onto rocker arm shaft.
- Lock retention pin (1) of rocker arm shaft into groove (2) of rocker arm bracket.



Oil bores of rocker arm shaft point towards cylinder head and operating side of engine.



- Insert locking ring.

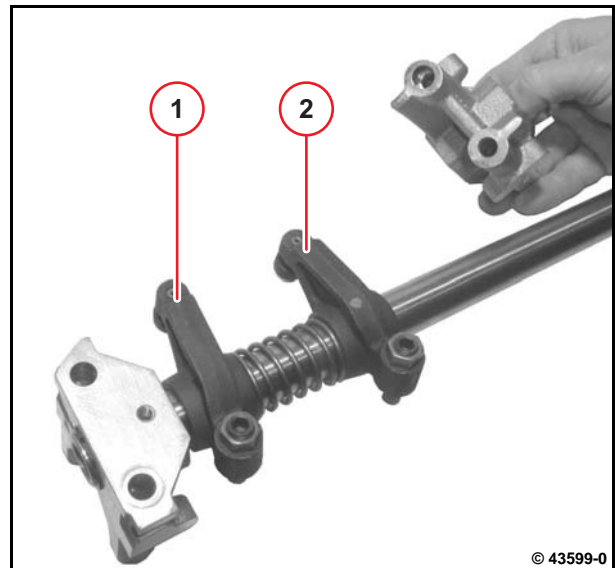


- Push the components onto rocker arm shaft in the order shown.



Rocker arm exhaust (1) then rocker arm inlet (2) and rocker arm bracket.

Pay attention to installation location of rocker arm brackets.



© 43599-0

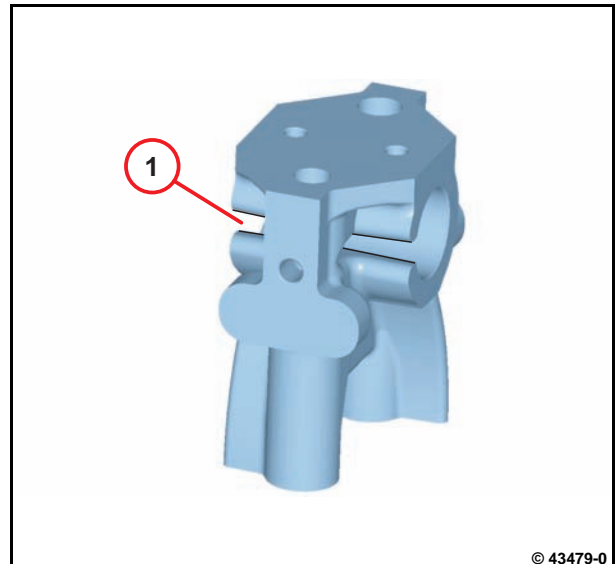
6



In engines without brake module:  
Slot (1) of rocker arm brackets points towards exhaust side.



In engines with brake module:  
Slot (1) of rocker arm brackets 2 and 5 points to operating side.



© 43479-0

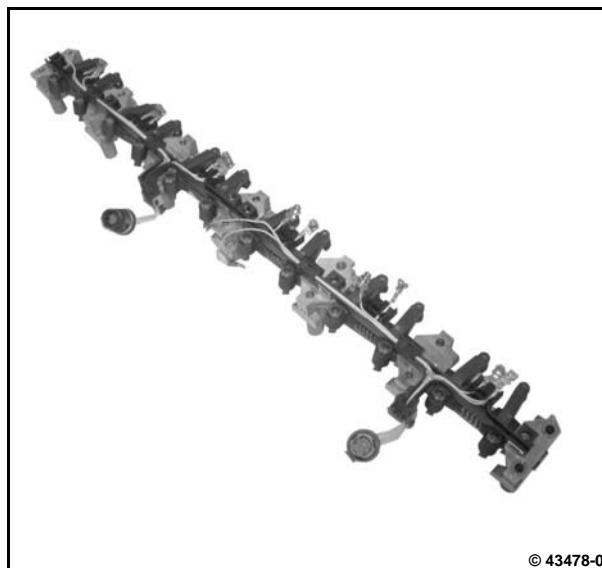
- Place last rocker arm bracket on and clamp.
- Insert locking ring in groove.



© 43602-0

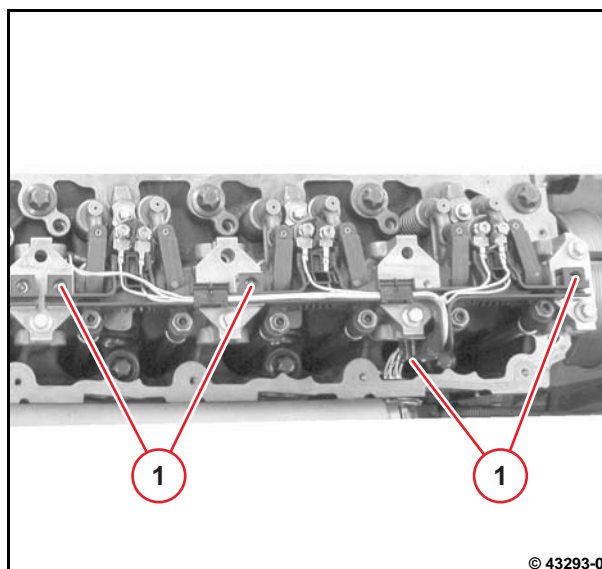
- Pre-assemble cable rail.
- Mount complete valve control on cylinder head.

 [W 01-02-02](#)



- Tighten cable rail (1).

 [A13 041](#)



## Removing and installing cylinder head



Commercial available tools:

- Rotation angle disc . . . . . 8190
- Pin wrench insert Torx E14 . . . . . 8113

Special tools:

- Socket wrench insert . . . . . 110700
- Assembly case . . . . . 110900
- Support bracket . . . . . 120900
- Base plate . . . . . 120910



- Fitting compound  
DEUTZ AP1908



- W 01-02-02
- W 01-04-09
- W 01-07-08
- W 06-01-05
- W 06-02-03
- W 09-08-04



Close all openings again immediately!

Collect leaking operating substances in suitable vessels and dispose of according to regulations.

The relevant documentation from the vehicle manufacturer must be observed when emptying and filling the cooling system.

### Removing the cylinder head

- Remove exhaust pipe and turbocharger.

 W 06-01-05

- Remove the charge air pipe.

 W 06-02-03

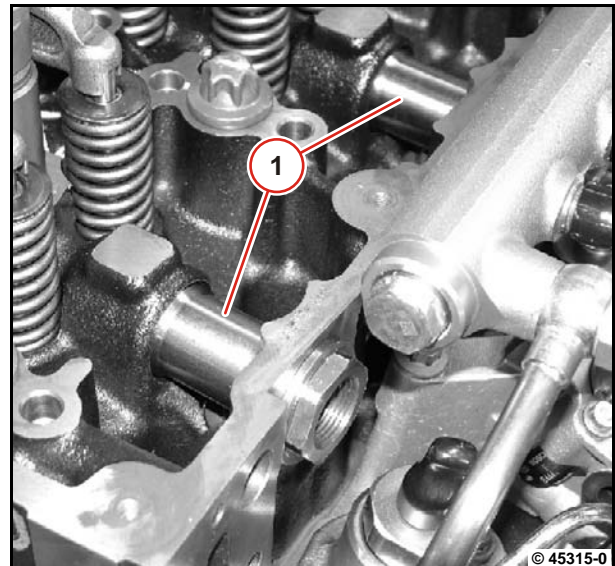
- Remove the valve control.

 W 01-02-02

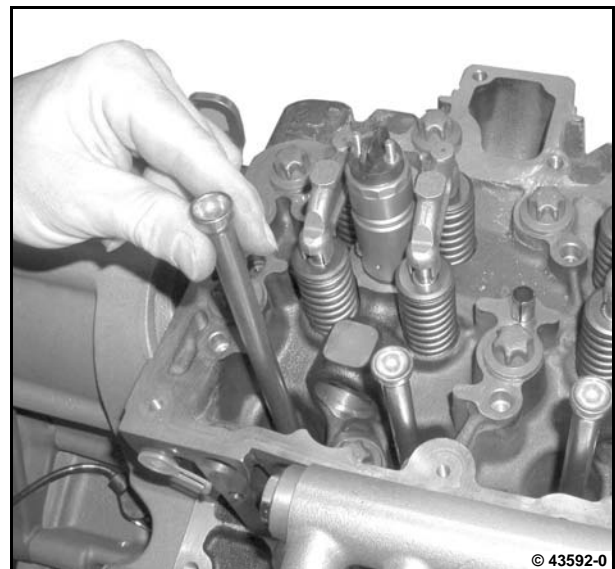
- Remove thermostat housing.

 W 09-08-04

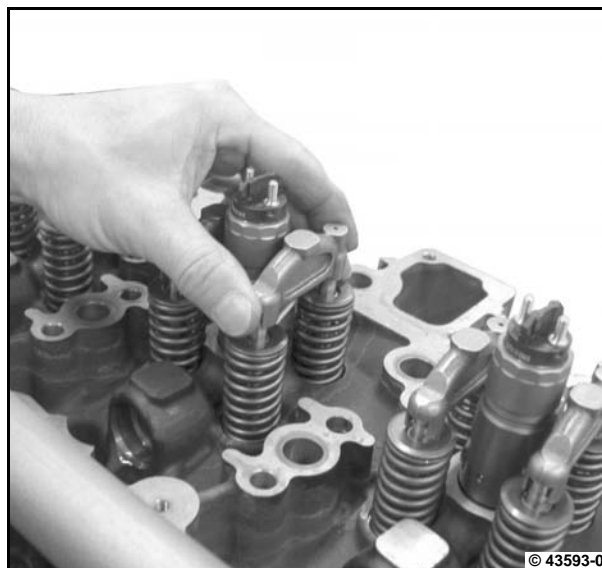
- Unscrew pressure pieces (1).



- Take out stop rods.



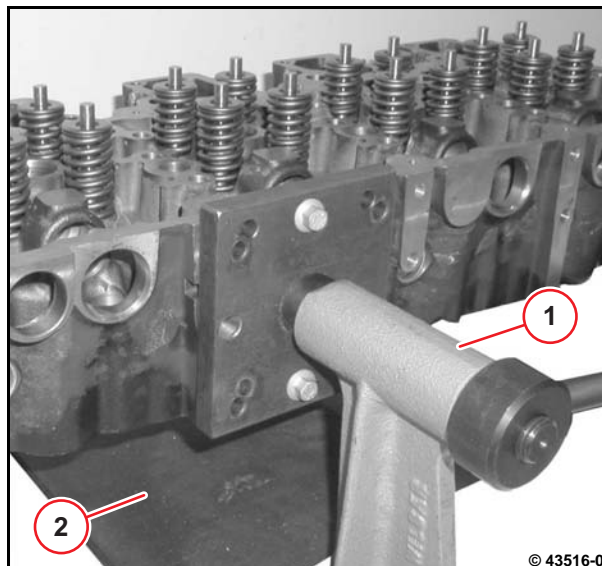
- Remove valve bridges.
- Unscrew cylinder head screws with pin wrench insert Torx E14.



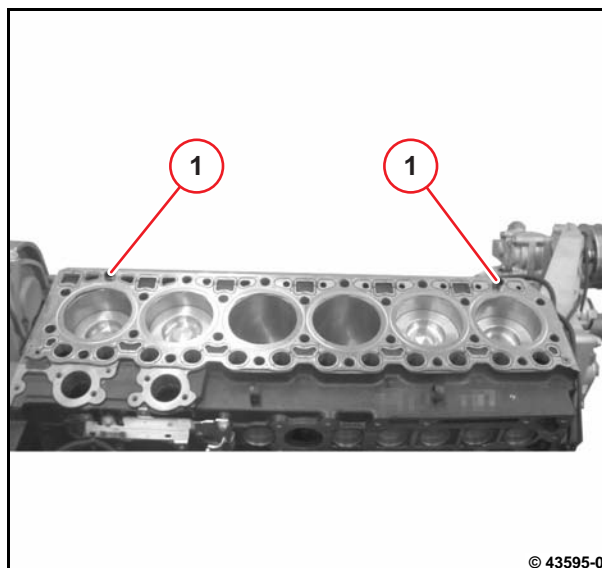
- Hook crane onto transport shackles.
- Lift cylinder head with crane.
- Screw cylinder head onto support bracket (1) and base plate (2).



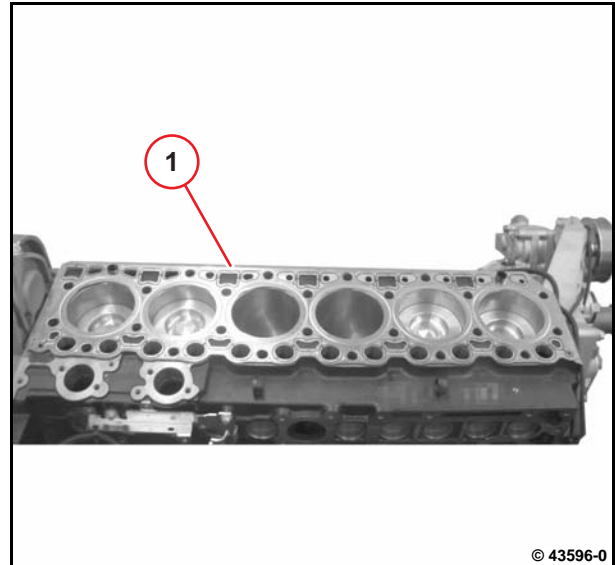
Do not place cylinder head on sealing surface.



Pay attention to clamping bushings (1).



- Remove cylinder head gasket (1).



### Installing the cylinder head

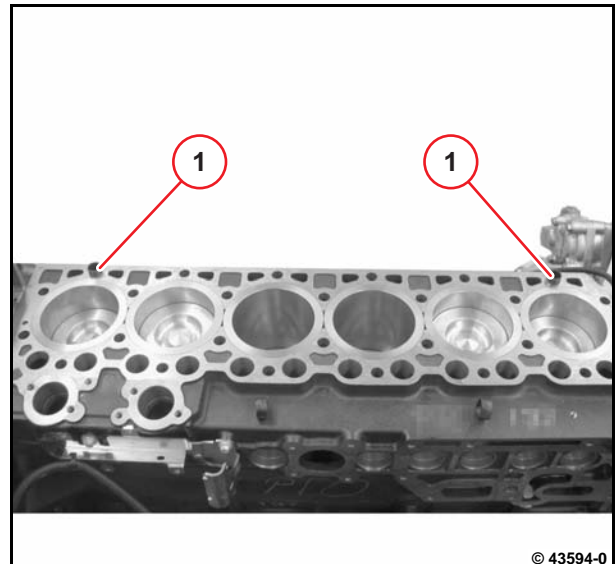
- Clean sealing surfaces.
- Measure the piston projection.

 W 01-04-09

- Check valve stand back.

 W 01-07-08

- Insert clamping bushing (1).



- Select cylinder head gasket according to the largest piston projection measured.

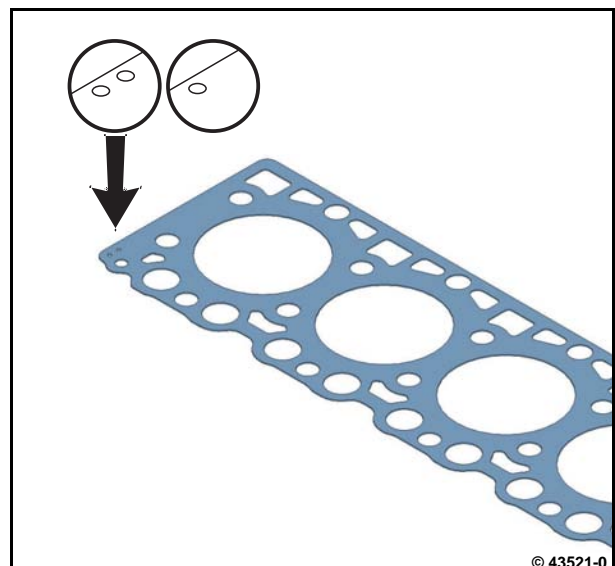
 P02 75

P02 76

- Place on cylinder head gasket.



The sealing surfaces for the cylinder head gasket must be clean and free of oil.  
Label OBEN / TOP facing the cylinder head.



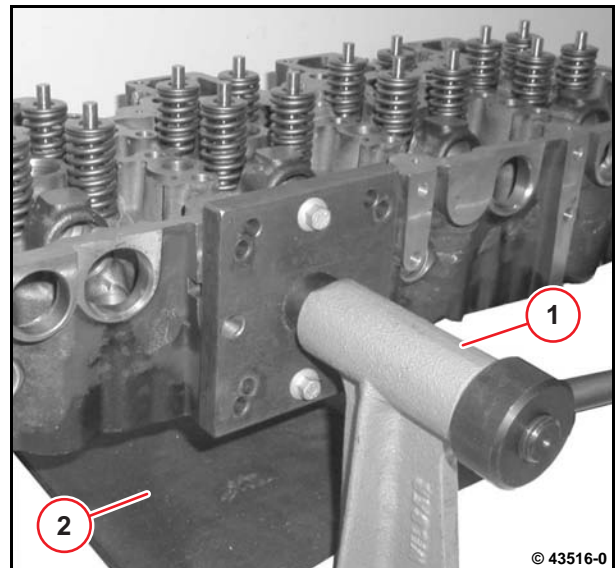


- Hook crane onto transport shackles.
- Lift cylinder head with crane.
- Remove cylinder head from support bracket (1).
- Remove support bracket from base plate (2).
- Place cylinder head on crankcase, lightly oil cylinder head screws and screw slightly.



Cylinder head screws can be re-used a maximum of 2 times upon verification.

- Unhook crane from transport shackles .

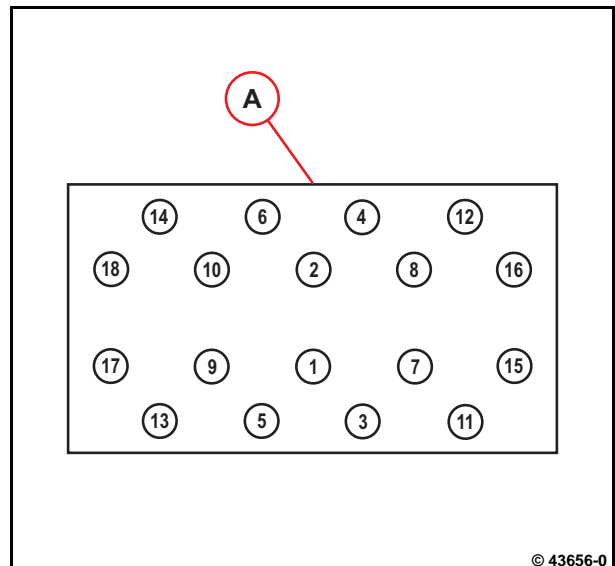


Tightening sequence for 4-cylinder engine  
A = exhaust side

- Tighten all cylinder head screws according to the tightening sequence.



A01 001

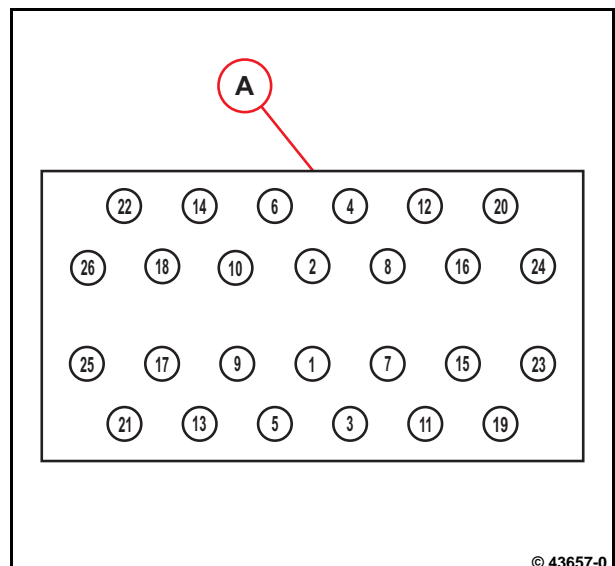


Tightening sequence for 6-cylinder engine  
A = exhaust side

- Tighten all cylinder head screws according to the tightening sequence.



A01 001

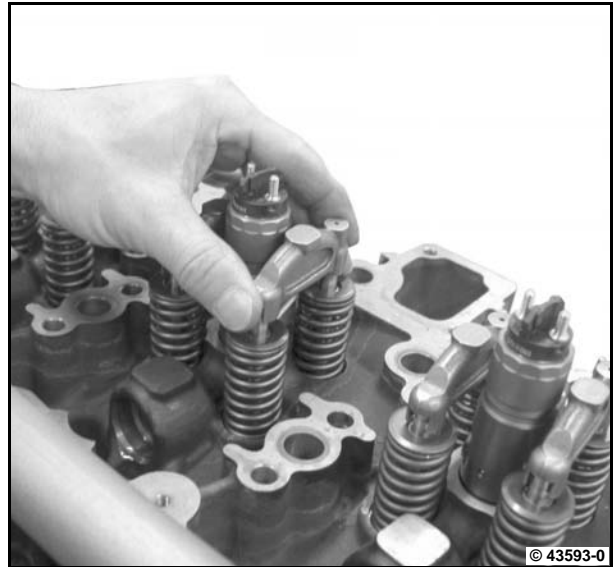




- Install valve bridges.



Lube oil bore points towards exhaust side.

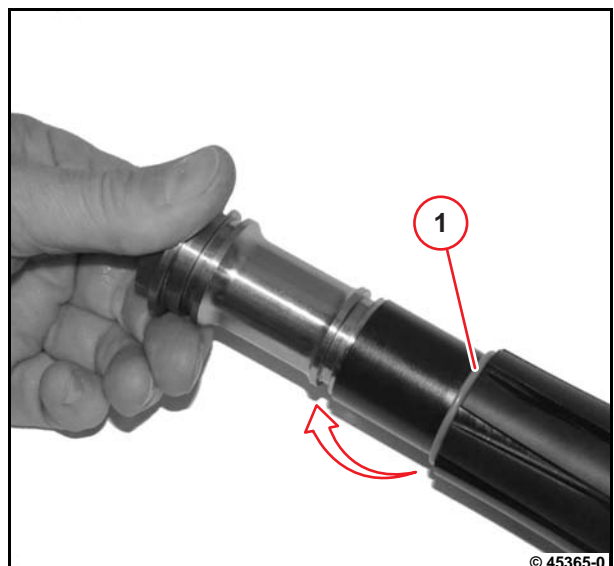


6

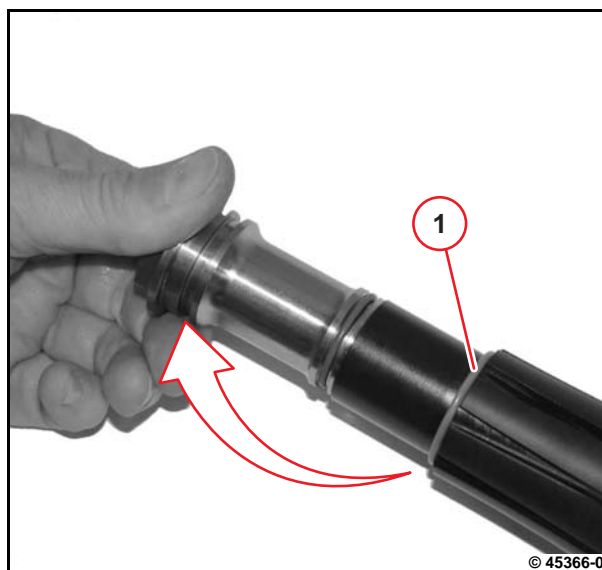
- Remove the O-ring (1) with the disassembly tool.
- Remove the O-ring (2) with the disassembly tool.



- Push on new O-ring (1) with mounting sleeve.

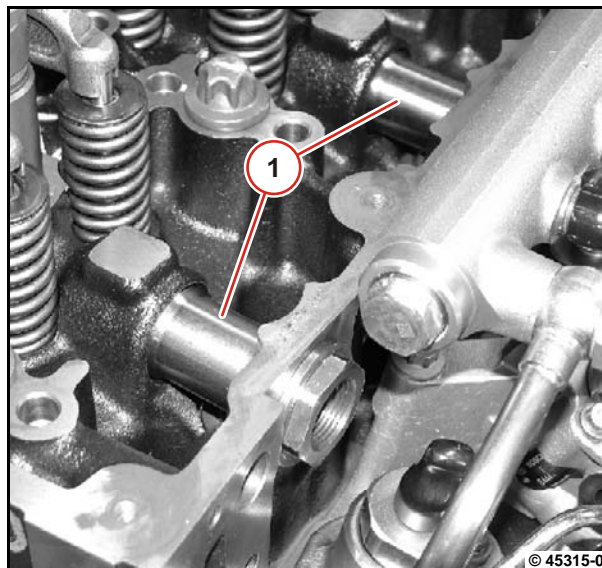


- Push on new O-ring (1) with mounting sleeve.
- Coat the O-rings with fitting compound.



- Insert pressure pieces (1).
- Tighten all pressure pieces.

 [A07 037](#)



- Insert stop rods.
- Install rocker arms and rocker arm brackets.

 [W 01-02-02](#)

- Install thermostat housing.

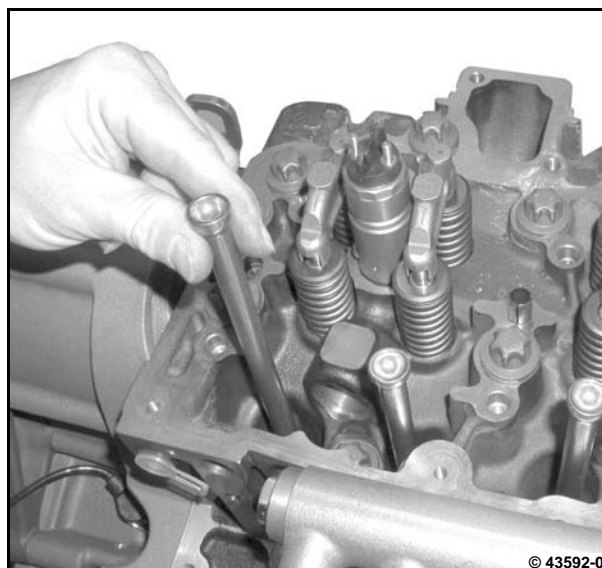
 [W 09-08-04](#)

- Install the charge air pipe.

 [W 06-02-03](#)

- Install exhaust pipe and turbocharger.

 [W 06-01-05](#)



## Checking piston overhang



Commercial available tools

Special tools:

- Dial gauge . . . . . 100400
- Measuring device . . . . . 100750



– W 01-04-04

## Checking piston overhang

- Remove cylinder head.

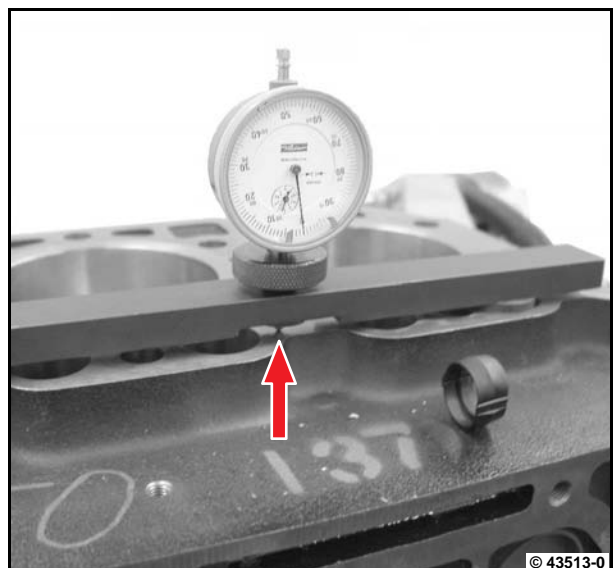


W 01-04-04

- Insert meter into measuring apparatus.
- Place spacing washers and measuring apparatus on the sealing surface of the crankcase.



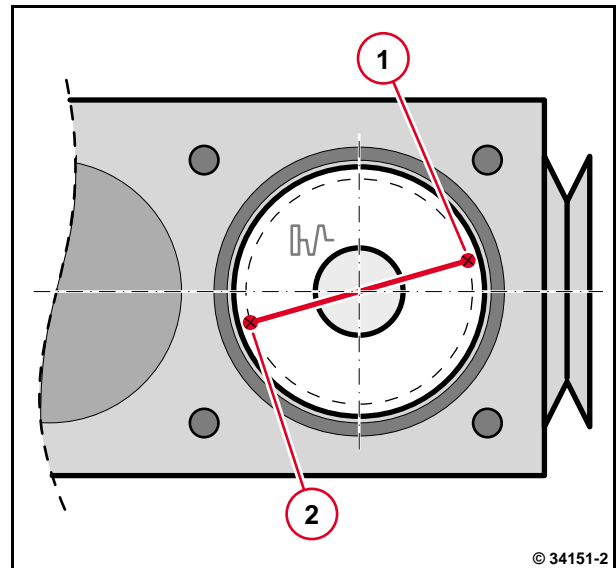
- Apply stylus of the dial gauge to the crankcase sealing surface with pre-tension (arrow).
- Adjust dial gauge to "0".



- Measure at the points (1) and (2) on the piston.



Schematic representation

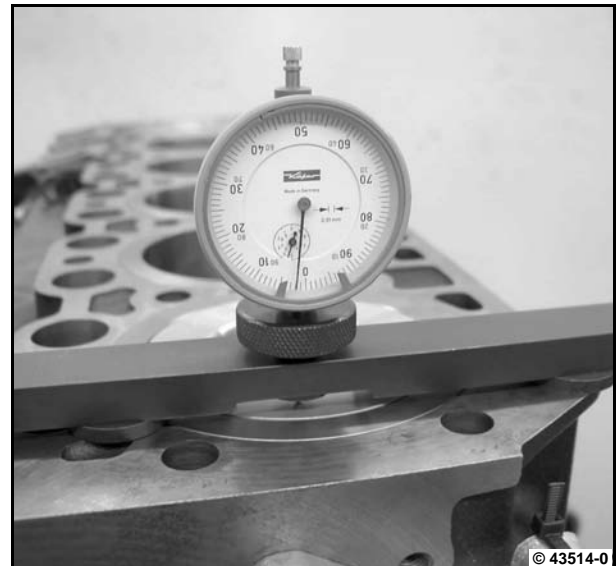


- Align the measuring apparatus on the spacing washers in such a way that the stylus lies on the specified measuring points.



Do not position the stylus on the piston marking.

- Note the largest measured value.



- Select cylinder head gasket according to the largest piston projection measured.



P02 75

P02 76

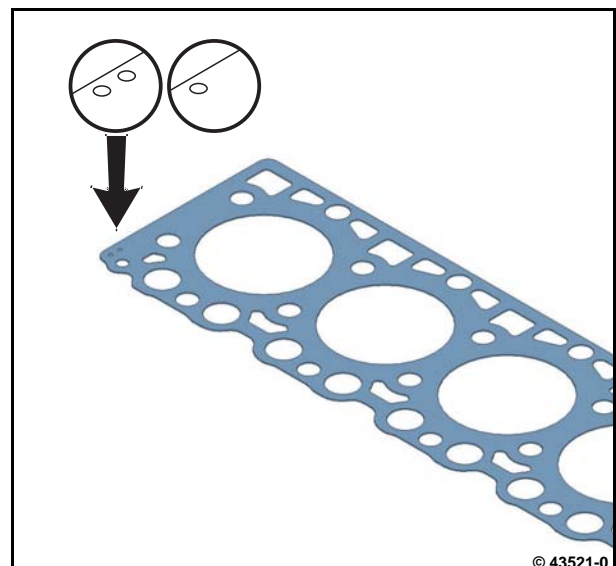


Example: Piston projection = 1.20 mm, corresponds to cylinder head gasket with 2 hole marking (arrow).

- Install cylinder head.



W 01-04-04



## Removing and installing the valves



Commercial available tools:

- Slide gauge
- Assembly pliers. . . . . 8024

Special tools:

- Support bracket . . . . . 120900
- Base plate. . . . . 120910
- Assembly lever . . . . . 121330
- Assembly tool . . . . . 121410
- Assembly sleeves. . . . . 121420



- W 01-04-04
- W 07-15-16

### Removing the valves

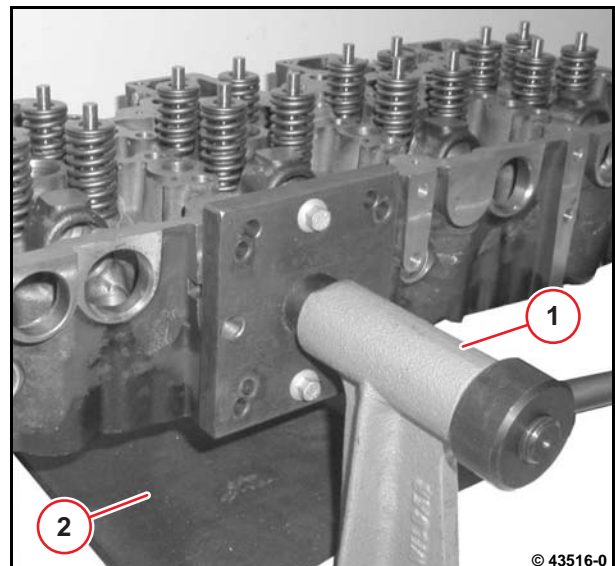
- Remove cylinder head.

 W 01-04-04

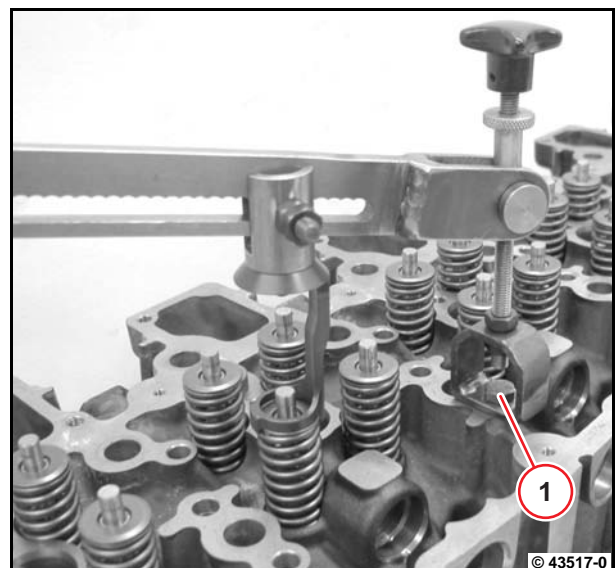
- Remove injectors.

 W 07-15-16

- Mount support bracket (1) on base plate (2).
- Mount cylinder head on support bracket.

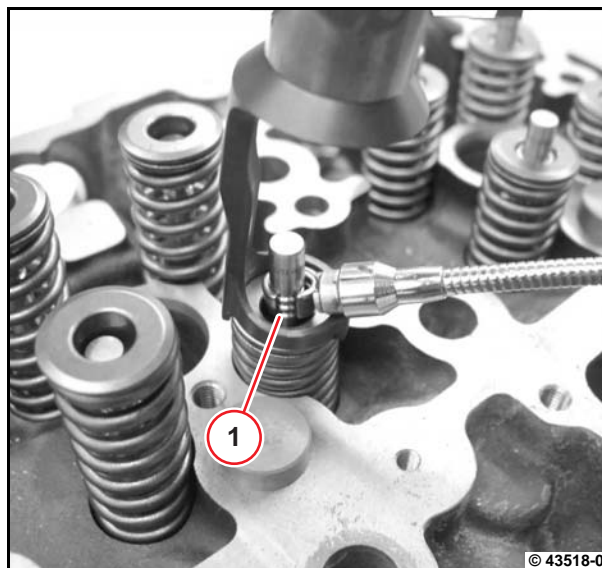


- Attach assembly lever with screw (1) to cylinder head.





- Press down valve spring with assembly lever.
- Remove both taper collets (1).
- Remove valve spring plates, valve springs and valves.
- Remove assembly lever.



- Disassemble valve stem gasket with assembly plier.
- Clean cylinder head.
- Check cylinder head.
- Visually inspect the components.



### Installing the valves

- Measure valve spring length with slide gauge.



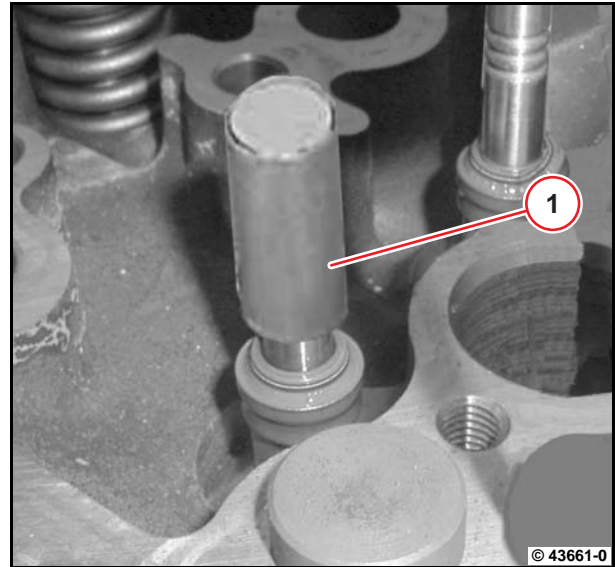
P01 51



When the wear limit is reached, the valve spring must be renewed.

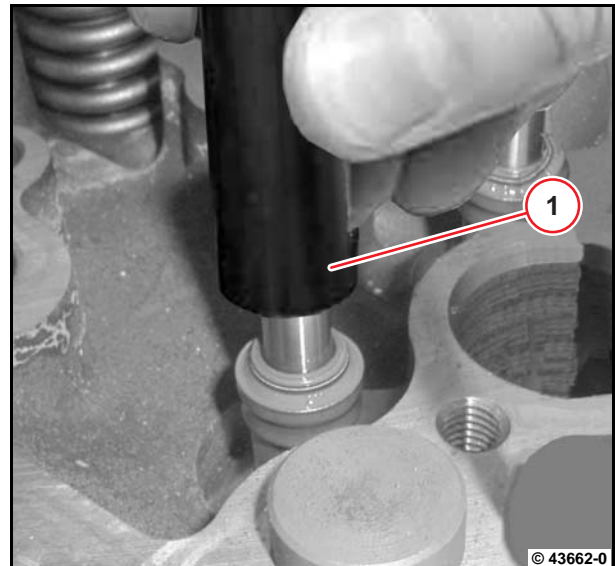


- Oil the valve stem lightly.
- Insert and hold valve.
- Push assembly sleeve (1) over the valve V-grooves.



6

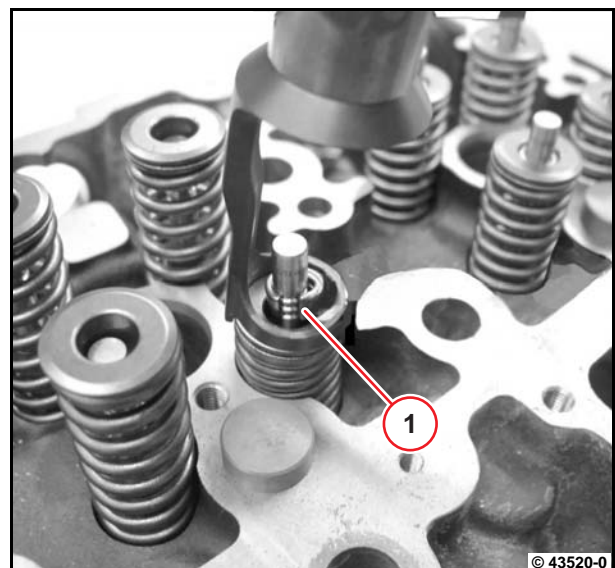
- Push new valve stem seal onto valve guide over the assembly sleeve with assembly tool (1).
- Remove assembly sleeve.



- Insert valve spring.
- Mount valve spring plate.
- Place assembly lever on valve spring plate.
- Press down the valve spring with the assembly lever and insert both taper collets (1).



Make sure the taper collets fit correctly in the valve keyway.

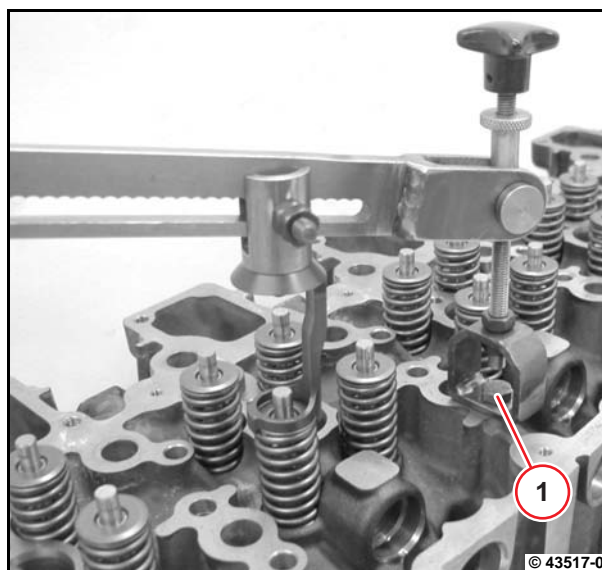


- Unscrew screw (1).
- Remove assembly lever.
- Remove cylinder head from support bracket.
- Install cylinder head.

 [W 01-04-04](#)

- Install the injectors.

 [W 07-15-16](#)





## Checking the valves



Commercial available tools:  
– Micrometer gauge  
– Slide gauge



– W 01-05-01

6

### Checking valve stem diameter

- Remove valves.



W 01-05-01

- Measure valve stem diameter with micrometer gauge.



P01 31

P01 32



© 42182-1

### Checking valve head diameter

- Measure valve head diameter with slide gauge.



P01 37

P01 38



© 42184-1



## Checking the valve guide



Commercial available tools:  
– Magnetic measuring stand

Special tools:

– Dial gauge. . . . . 100400



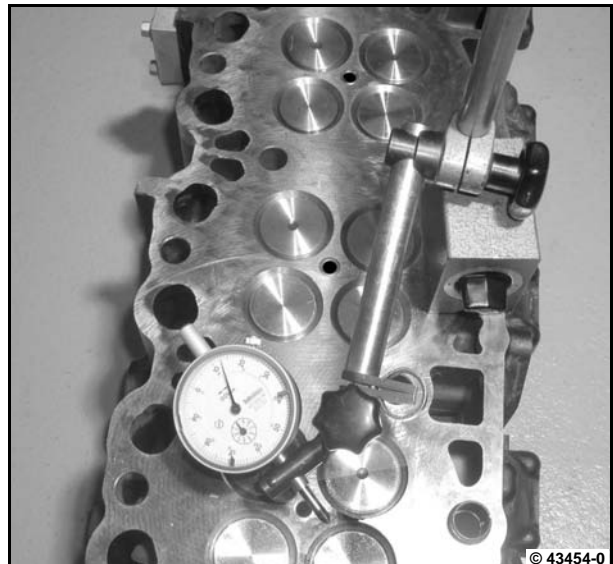
– W 01-05-01

### Measure valve stem clearance

- Remove valves and valve stem gasket.

 W 01-05-01

- Visually inspect valve guide for wear.
- Mount magnetic measuring stand.
- Insert dial gauge.
- Insert new valve.
- Place stylus under pre-tension on the valve head (arrow).
- Adjust dial gauge to "0".



- Move valve back and forth in direction of arrow.



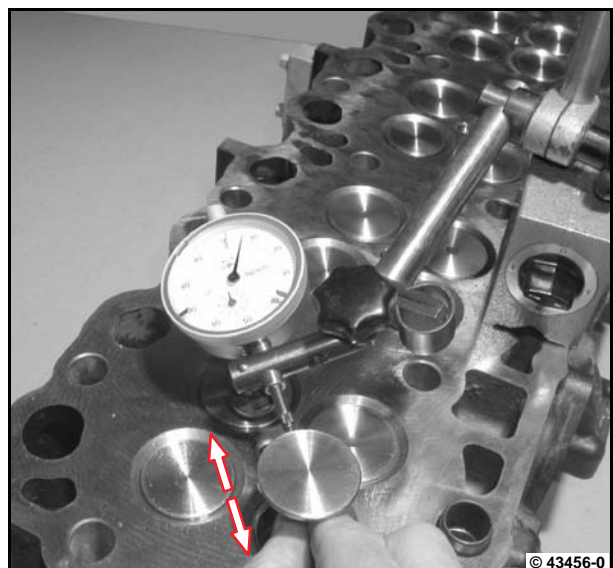
The valve stem ends must be flush with the valve guide.  
The whole tilt distance must be taken into account.

- Read off measured value.



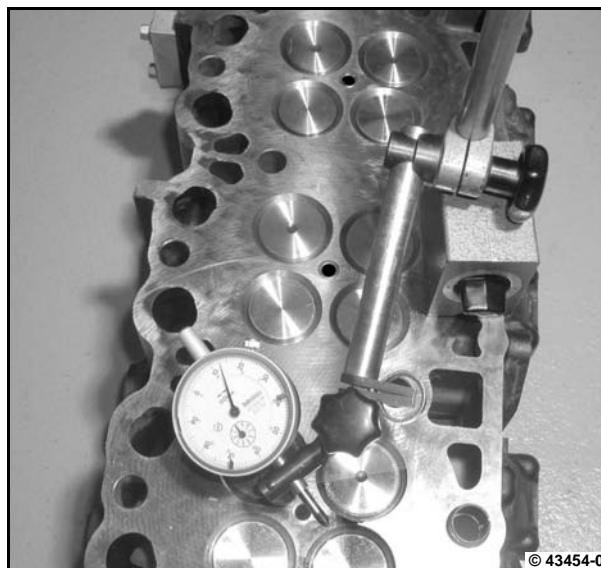
P01 33

P01 34



- Remove magnetic measuring stand.
- Remove dial gauge.
- Install valve stem gasket and valves.

 [W 01-05-01](#)



## Checking the valve lag



Commercial available tools

Special tools:

- Dial gauge. . . . . 100400
- Measuring device . . . . . 100750
- Support bracket . . . . . 120900
- Base plate. . . . . 120910



– W 01-04-04



### Attention!

When the wear limit is reached, the valve seat insert and/or valve must be renewed.

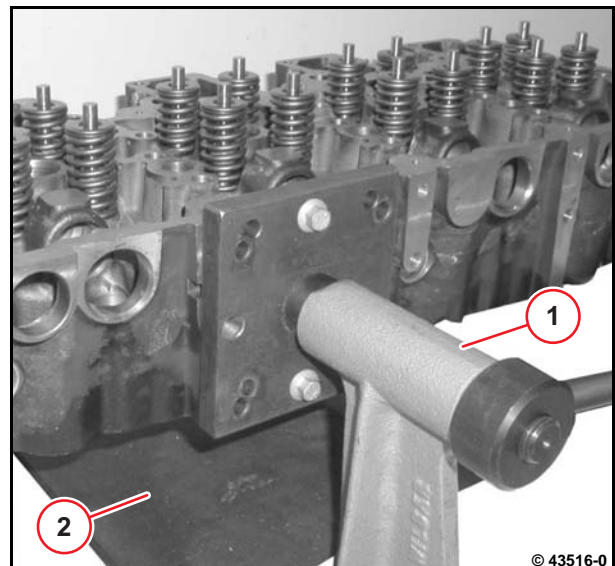
## Checking the valve lag

- Remove cylinder head.

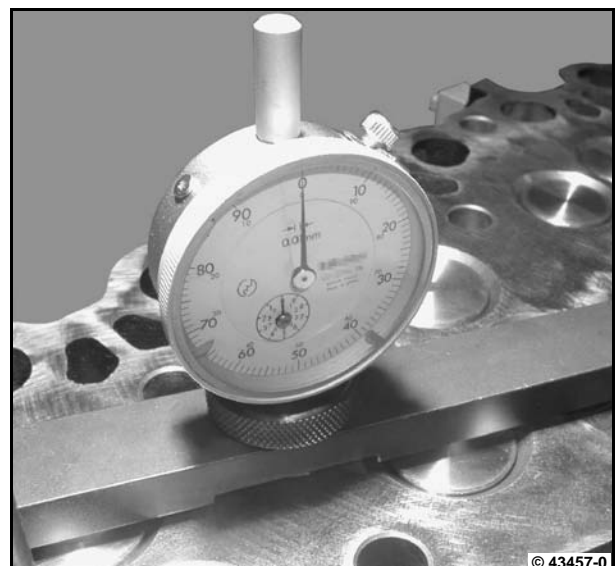


W 01-04-04

- Mount support bracket (1) on base plate (2).
- Screw cylinder head onto support bracket (1) and base plate (2).
- Turn cylinder head sealing surface to face upwards.



- Insert meter into measuring apparatus.
- Place measuring apparatus onto cylinder head surface.
- Apply stylus under pre-tension to the cylinder head area and adjust meter to "0".



- Move measuring apparatus until the stylus rests on the valve plate.
- Measure valve stand back.



P01 45

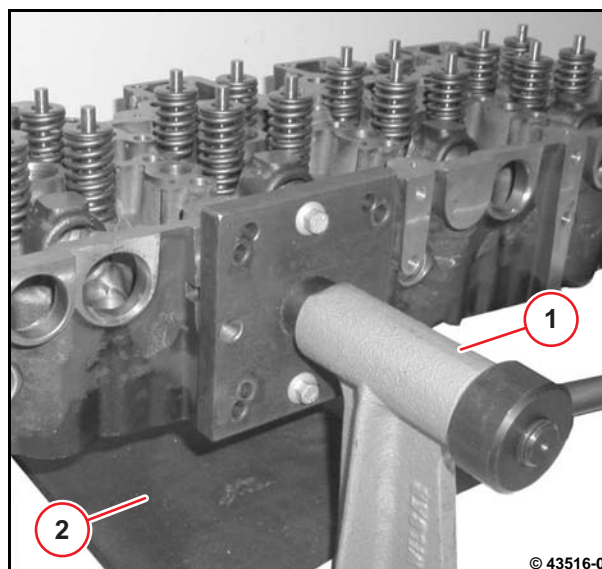
P01 46



- Remove cylinder head from support bracket (1).
- Remove support bracket from base plate (2).
- Install cylinder head.



W 01-04-04



## Checking the axial clearance of the crankshaft



Commercial available tools:

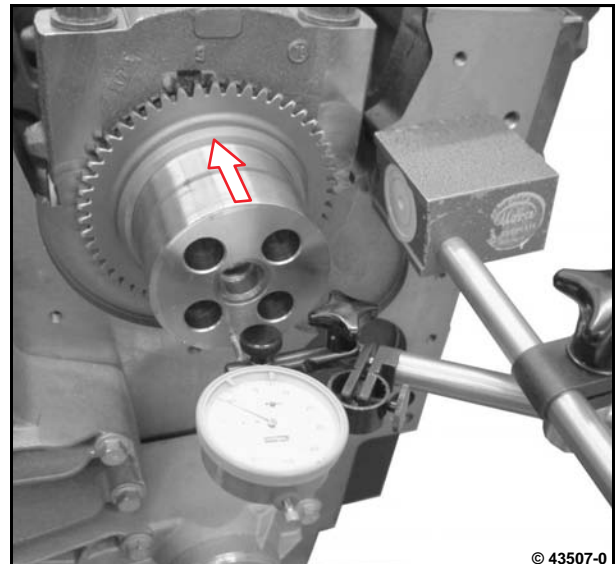
- Magnetic measuring stand
- Micrometer gauge

Special tools:

- Dial gauge. . . . . 100400

### Checking the axial backlash

- Mount magnetic measuring stand.
- Insert dial gauge.
- Apply stylus to the crankshaft end with pre-tension.
- Press crankshaft in direction of arrow.
- Adjust dial gauge to "0".

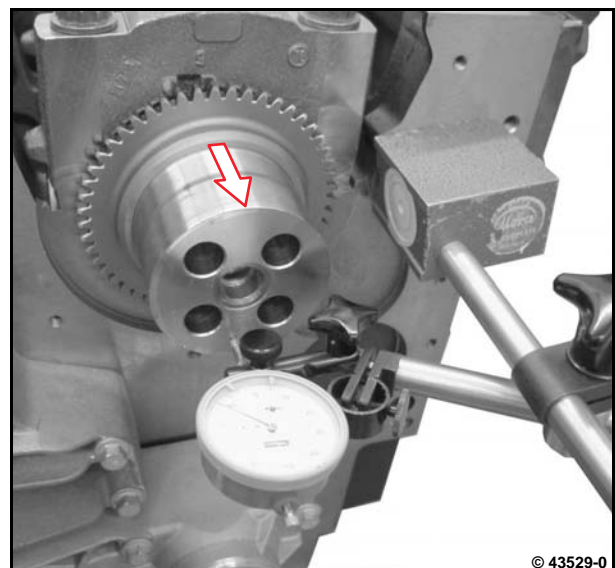


© 43507-0

- Press crankshaft in direction of arrow.
- Read off measured value.



P02 34



© 43529-0



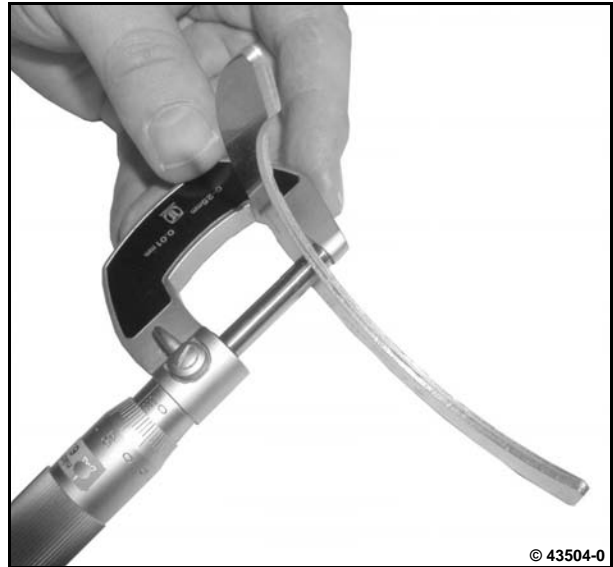
- Measure the strength of thrust ring halves.



P02 35

P02 36

- Select thrust ring halves according to measured value.

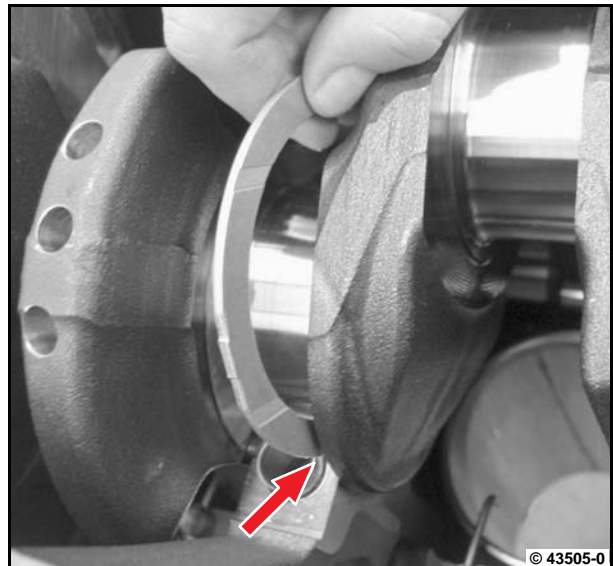


- Install upper thrust ring halves according to measured axial clearance.



Oil grooves of the thrust ring halves face the web face of the crankshaft.

Insert thrust ring halves between crankcase and crankshaft web (arrows).



- Hold lower thrust ring halves on fit bearing cover and insert together with fit bearing cover.

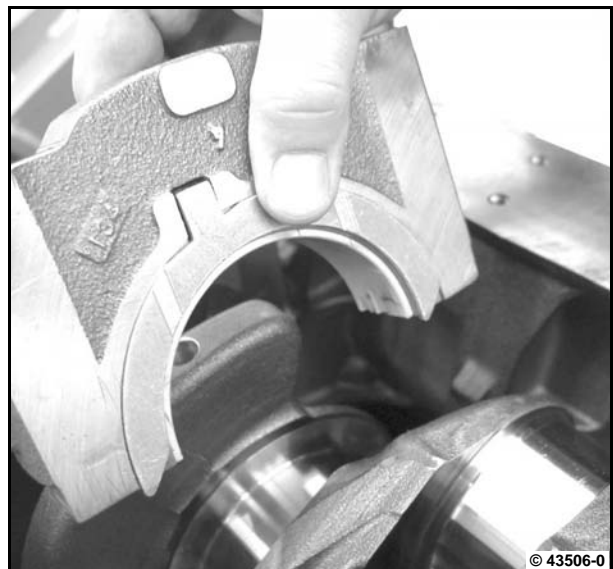


Oil grooves of the thrust ring halves face the web face of the crankshaft.

- Tighten fit bearing cover.



A02 010

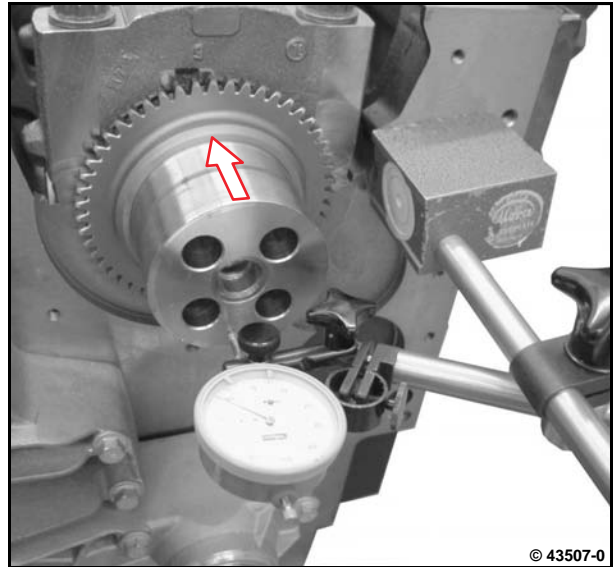




- Move crankshaft longitudinally.
- Read axial clearance from the dial gauge.

**P02 34**

- Compare actual value with setpoint value.
- Remove magnetic measuring stand.
- Remove dial gauge.





## Checking the crankshaft



Commercial available tools:

- Magnetic measuring stand
- Micrometer gauge
- Internal measuring device
- Prisms
- Hardness tester

Special tools:

- Dial gauge. . . . . 100400



– W 02-04-01

## Checking the bearing pin hardness

- Remove crankshaft.

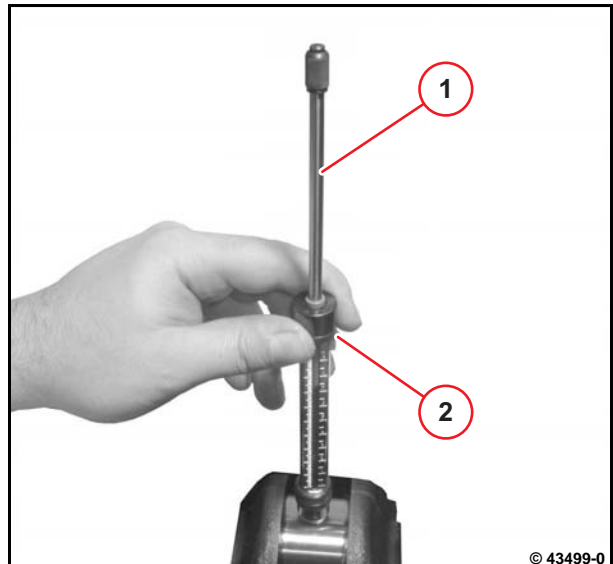


W 02-04-01

- Place crankshaft on prism.
- Put hardness tester on journal.
- Raise stylus (1) and press release (2).



Stylus (1) falls down, briefly strikes the surface and jumps up to the measured value.



- Read off displayed value (arrow) from hardness tester.



P02 07



The measured value is to be converted according to the table of the measuring device.

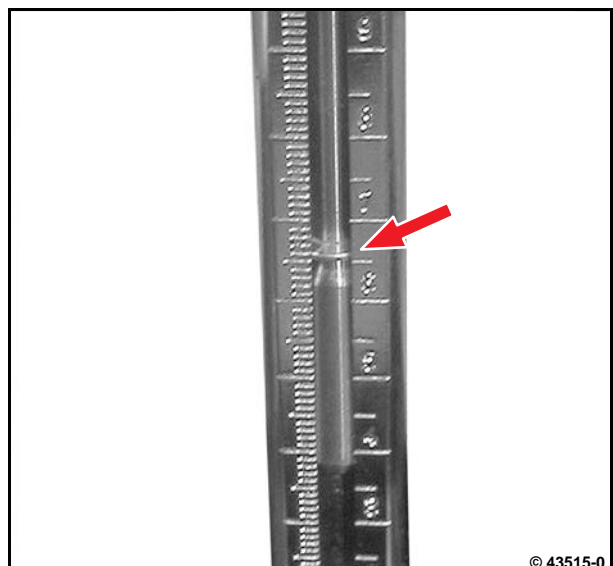
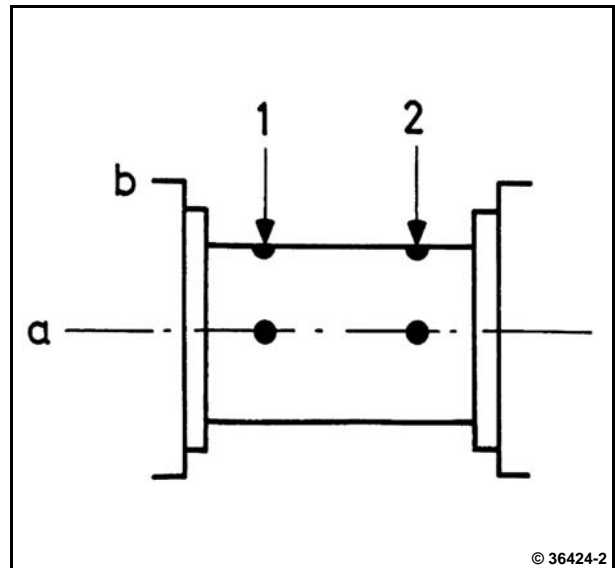




Diagram for measuring the journals at the points 1 and 2 in the levels a and b.



### Checking the diameter of the main bearing pins

- Measure main bearing pin with micrometer gauge.

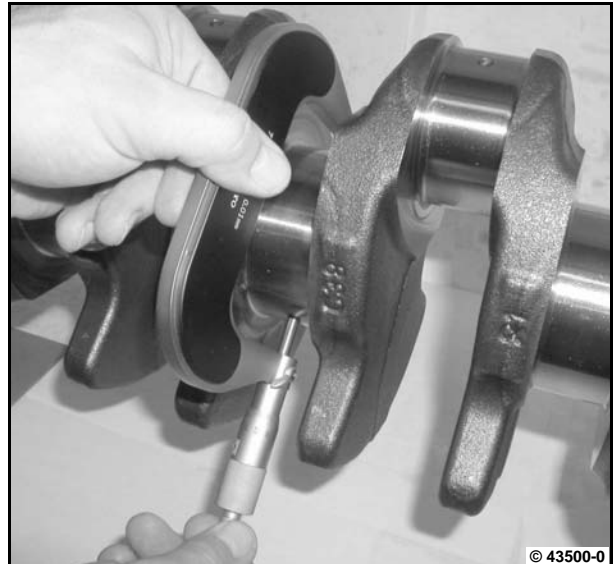


Measuring points see diagram.



P02 03

P02 04



### Checking the diameter of the lifting journals

- Measure lifting journal with micrometer gauge.



Measuring points see diagram.



P02 22

P02 23

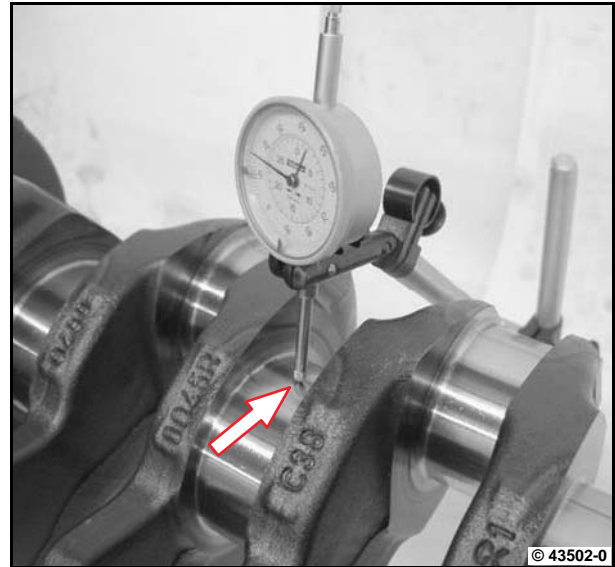


## Checking the rotation

- Mount magnetic measuring stand.
- Insert dial gauge.
- Apply stylus to the main bearing pin with pre-tension (arrow) and adjust dial gauge to "0".
- Turn crankshaft evenly and check rotation.

 P02 26

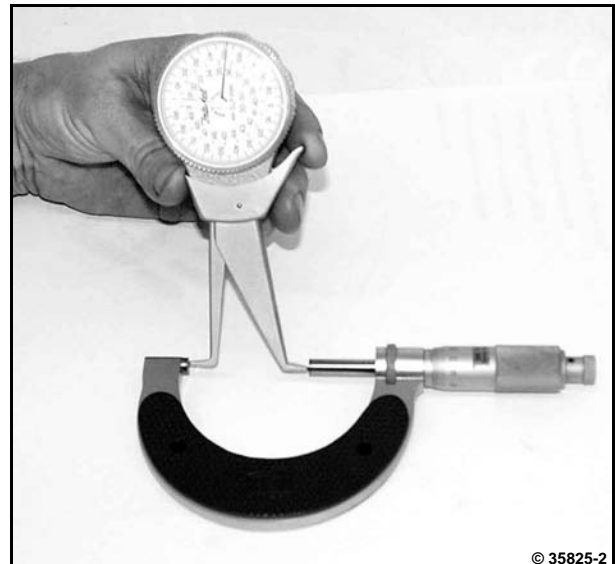
- Remove magnetic measuring stand.
- Remove dial gauge.



6

## Measuring the fit bearing width

- Set the micrometer gauge to 35 mm.
- Push the internal measuring device between the test surfaces of the micrometer gauge and set to "0".



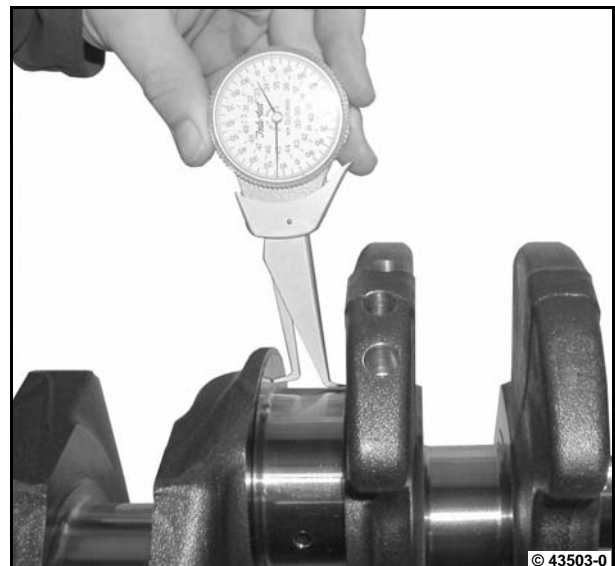
- Measure locating bearing width
- Note measured value.

 P02 11

P02 12

- Visually inspect all running surfaces.
- Install crankshaft.

 W 02-04-01





## Renewing the crankshaft sealing ring (flywheel side)



Commercial available tools:

– Pricker. . . . . 8198

Special tools:

– Assembly tool . . . . . 142810



– W 12-06-01

6

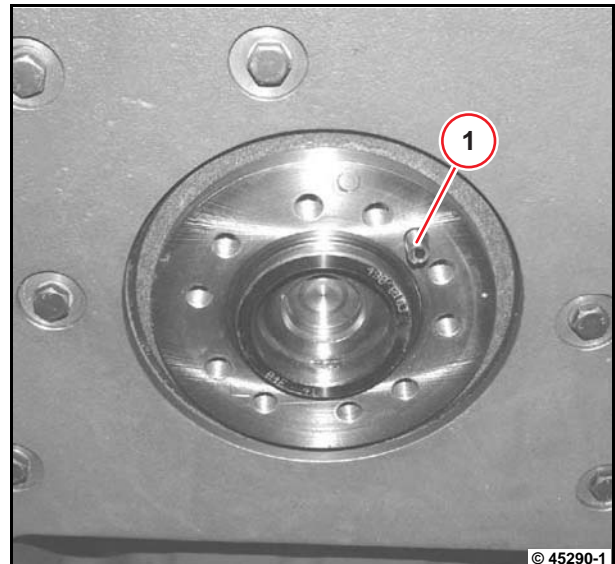
### Removing the crankshaft sealing ring

- Remove flywheel.



W 12-06-01

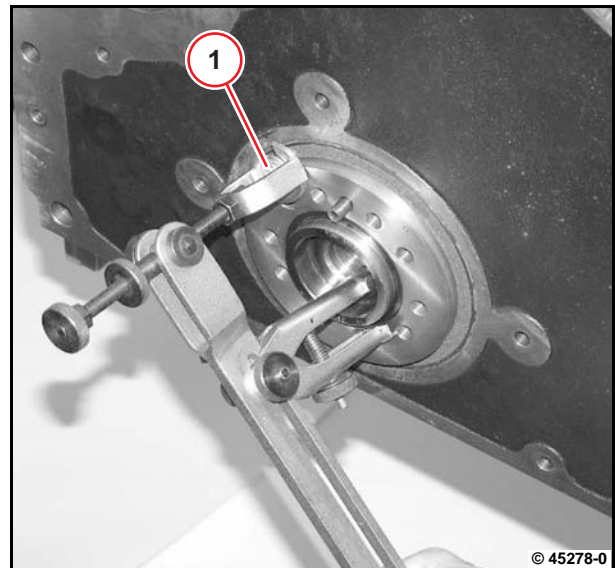
- Remove clamping bushing (1).



- Make a hole of approximately 3 mm in the crankshaft sealing ring with a pricker.

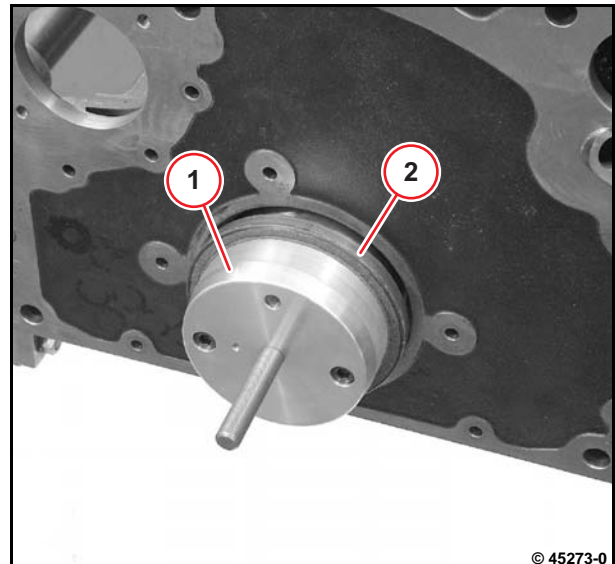


- Screw in a self-tapping screw (1) with washer.
- Pull out the crankshaft sealing ring with assembly lever.
- Visually inspect the crankshaft sealing ring running surface.



### **Installing the crankshaft sealing ring**

- Mount guide sleeve (1).
- Oil the sealing lip of the crankshaft sealing ring lightly.
- Push the crankshaft sealing ring (2) carefully onto the guide sleeve.

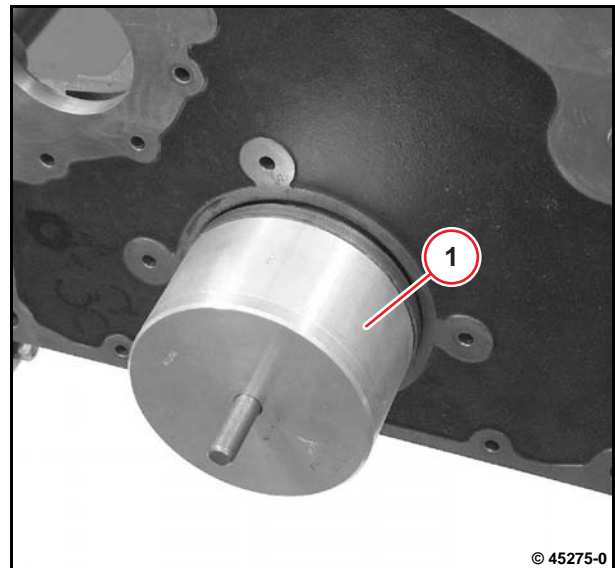


- Pay attention to installation depth of crankshaft sealing ring and select shim accordingly.
  - First assembly = 2 shims
  - 1. Repair installation depth = 1 shim
  - Maximum installation depth = without washers





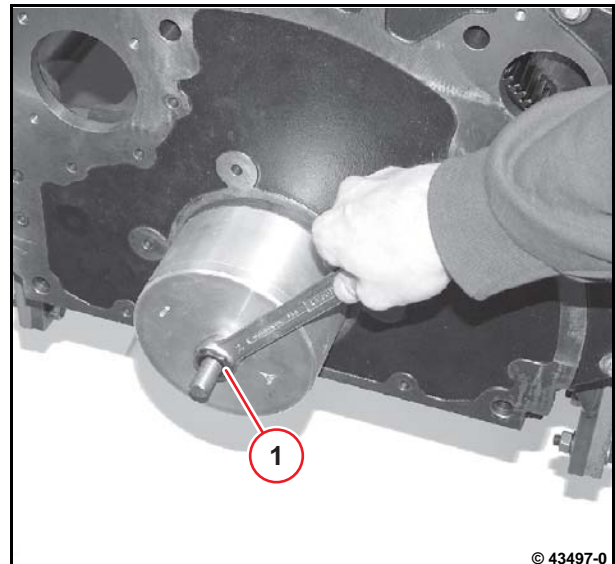
- Mount assembly sleeve (1).



- Tighten nut to the stop of the assembly sleeve (1).



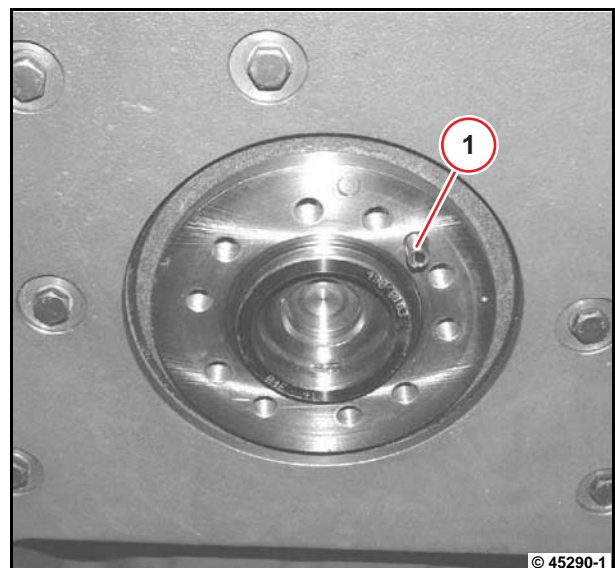
The crankshaft sealing ring is now at the pre-selected installation depth.



- Insert clamping bushing (1).
- Install flywheel.



W 12-06-01





## Renewing the crankshaft sealing ring (opposite side to flywheel)



Commercial available tools:

– Pricker. . . . . 8198

Special tools:

– Assembly tool . . . . . 142820



– W 12-01-04

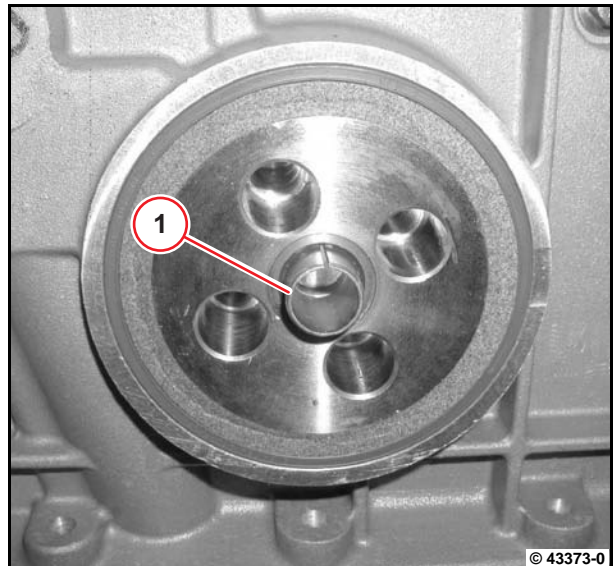
### Removing the crankshaft sealing ring

- Removing torsional vibration damper.



W 12-01-04

- Remove clamping bushing (1).



- Make a hole of approximately 3 mm in the crankshaft sealing ring with a pricker.

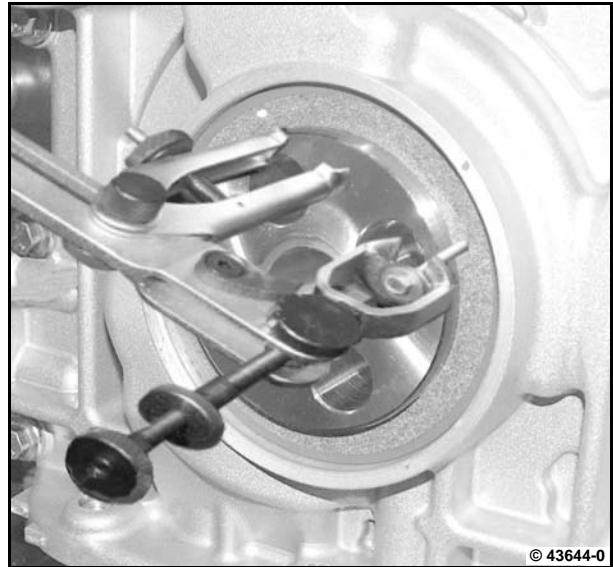


- Turn in a self-tapping screw with washer.
- Pull out the crankshaft sealing ring with assembly lever.



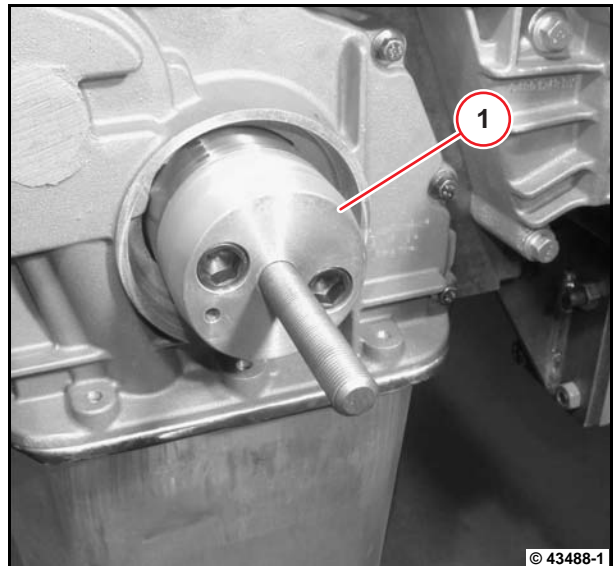
Ensure that the crankshaft does not get damaged.

- Visually inspect the crankshaft sealing ring running surface.

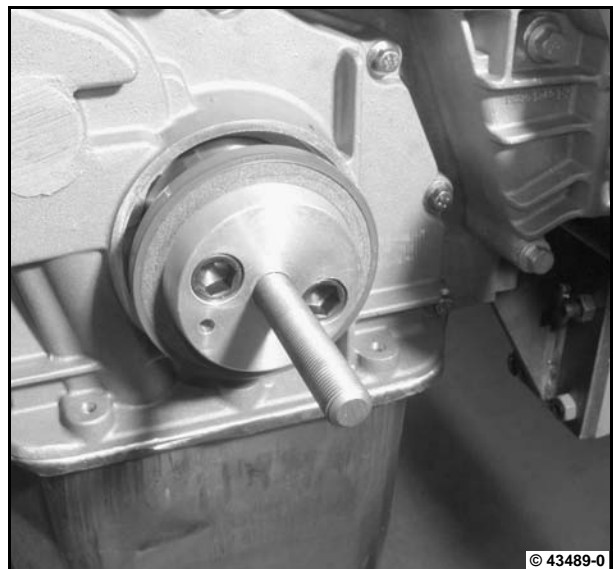


### **Installing the crankshaft sealing ring**

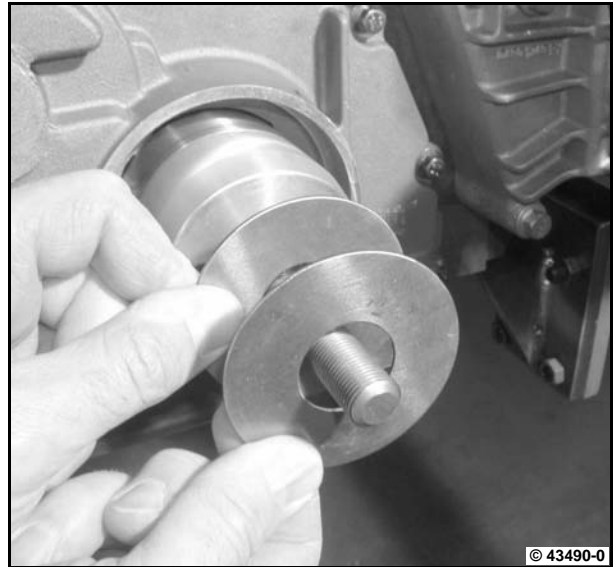
- Mount guide sleeve (1).



- Oil the sealing lip of the crankshaft sealing ring lightly.
- Push the crankshaft sealing ring carefully onto the guide sleeve.



- Pay attention to installation depth of crankshaft sealing ring and select shim accordingly.
  - First assembly = 2 shims
  - 1. Repair installation depth = 1 shim
  - Maximum installation depth = without washers



6

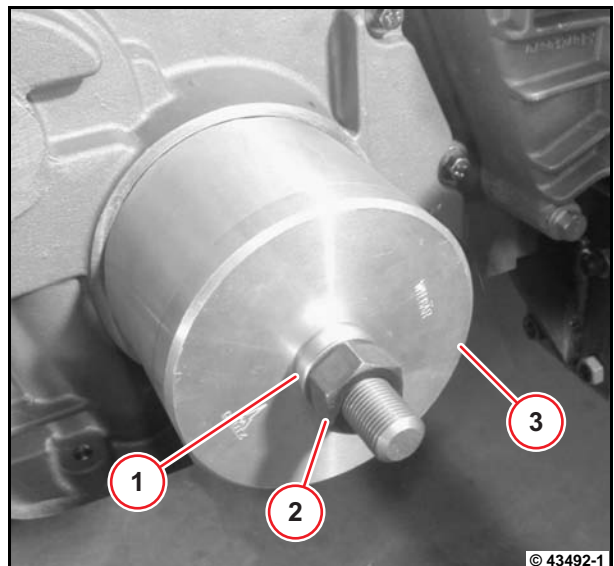
- Mount assembly sleeve.
- Press on the crankshaft sealing ring to the stop.



- Plug in the bearing (1).
- Screw on nut (2).
- Tighten nut to the stop of the assembly sleeve (3).

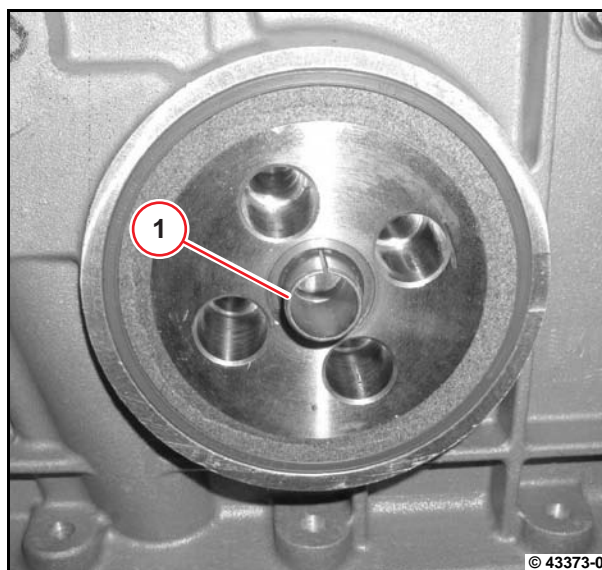


The crankshaft sealing ring is now at the pre-selected installation depth.



- Insert clamping bushing (1).
- Install torsional vibration damper.

 [W 12-01-04](#)





## Removing and installing the crankshaft



Commercial available tools:

- Internal measuring device
- Micrometer gauge
- Rotation angle disc . . . . . 8190
- Socket wrench insert . . . . . 8035

Special tools:

- Dial gauge. . . . . 100 400



- W 02-01-04
- W 02-09-03
- W 03-08-01
- W 04-04-10

### Removing crankshaft

- Remove piston and connecting rod.

 W 02-09-03

- Remove front cover.

 W 03-08-01

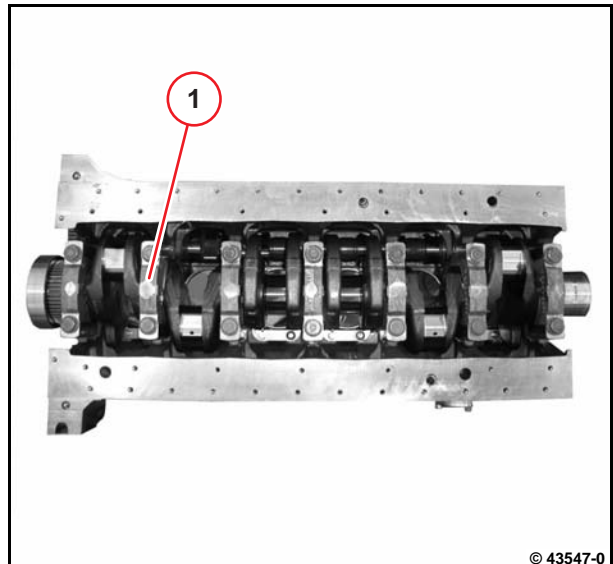
- Remove gearcase.

 W 04-04-10

- Unscrew all screws (1).



Use socket wrench insert.



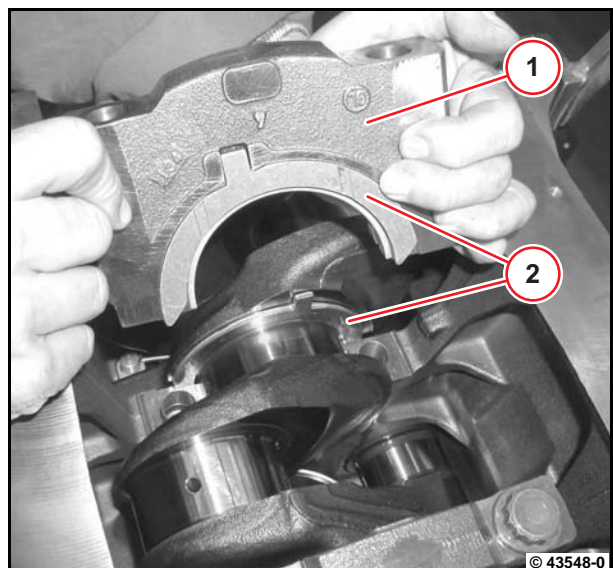
© 43547-0

- Remove fit bearing cover (1) and main bearing cover.



Lay out components in the order in which they should be installed.

- Remove lower thrust ring halves (2).



© 43548-0

- Lift out the crankshaft.
- Place crankshaft on prism.
- Remove upper bearing shells and upper thrust ring halves from crankcase.
- Remove both thrust ring halves.



Remove bearing shells according to the order of assembly.



6

### **Installing the crankshaft**

- Insert upper main bearing shells.



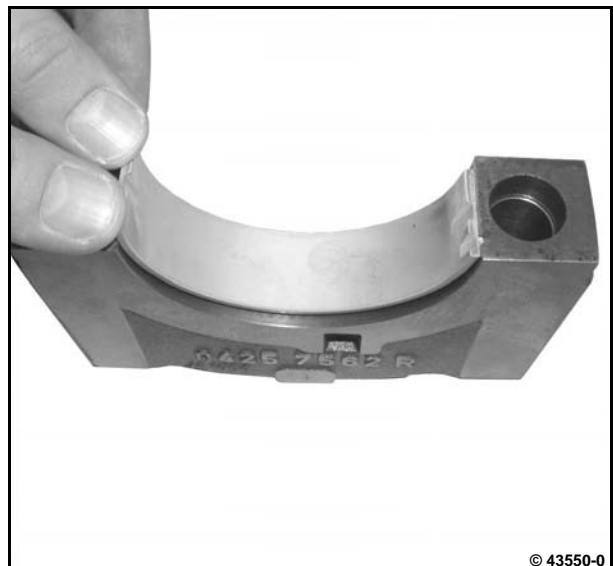
Ensure that the installation location is free from faults.



- Insert lower main bearing shells in the respective main bearing cover.

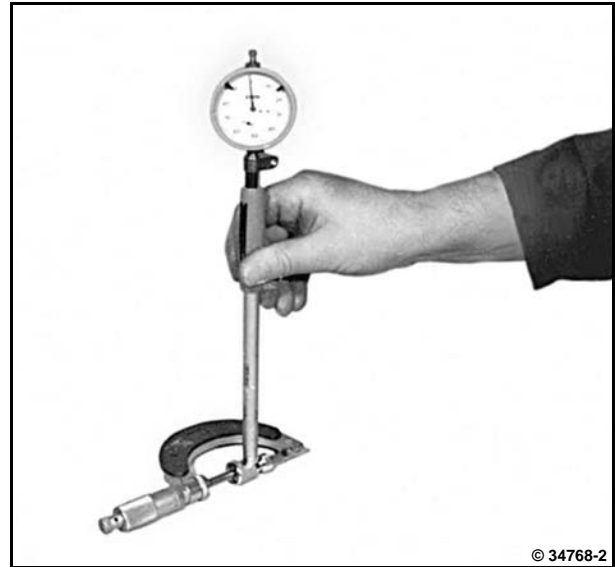


Ensure that the installation location is free from faults.





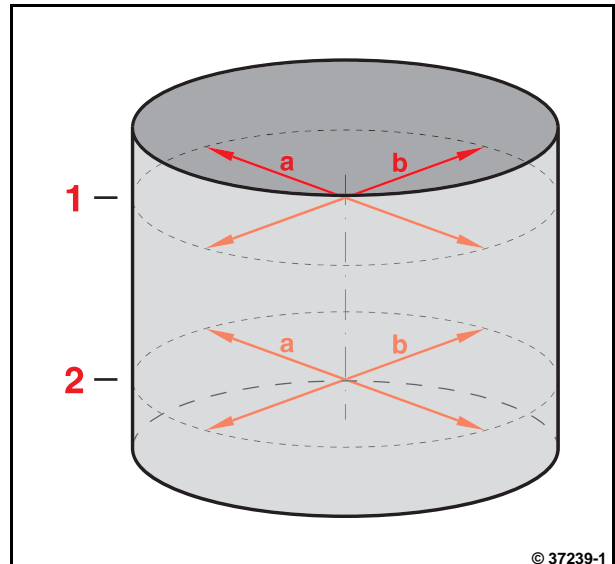
- Prepare internal measuring device:
  - Mount probe bolt for the appropriate measuring range in the internal measuring device.
  - Mount dial gauge with approx. 1 mm pre-tension in the internal measuring device.
  - Set micrometer gauge to 85 mm.
  - Balance the internal measuring device between the test surfaces of the micrometer gauge and set the meter to the reversal point of the pointer to "0".



6



Diagram for measuring the main bearing diameter at the points "a" and "b" in the levels "1" and "2".



- Install main bearing cover.
- Tighten screws .
- Insert internal measuring device.
- Measure main bearing diameter.
- Removing the main bearing cover.



A02 010



Ensure that the installation location of the upper bearing shells is free from faults.



- Oil bearing shells with engine oil.
- Position camshaft.

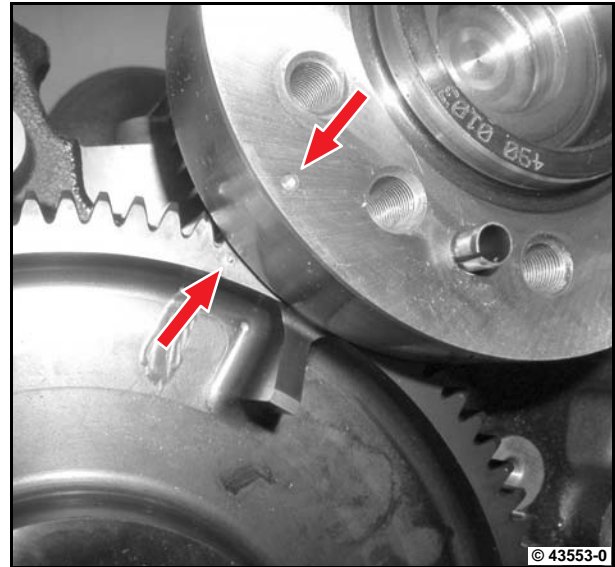


The markings (arrows) must be in line when the crankshaft is installed.  
A help mark (colour) can be made.

- Insert crankshaft.



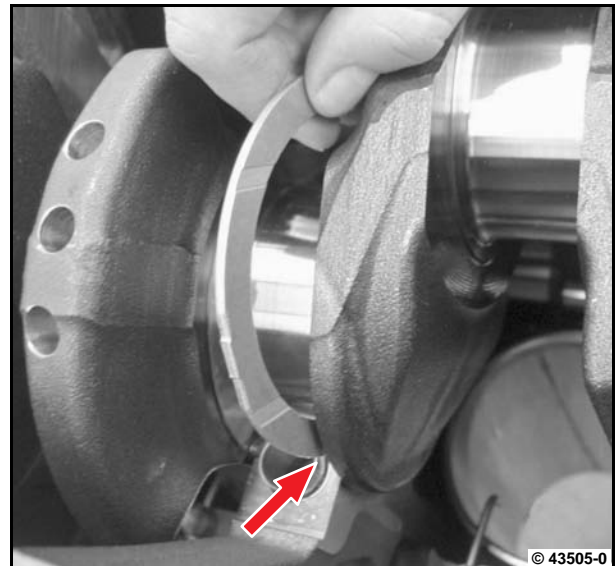
Make sure that the markings match up.



- Install upper thrust ring halves according to measured axial clearance.



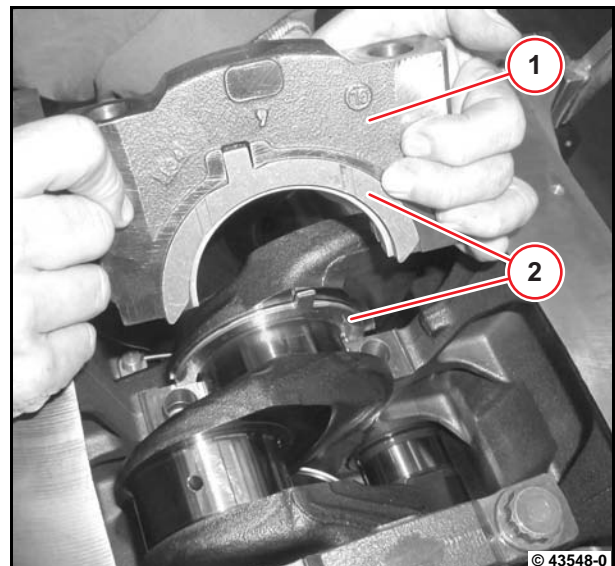
Oil grooves of the thrust ring halves face the crankshaft web face.  
Insert thrust ring halves between crankcase and crankshaft web (arrow).



- Oil bearing shells with engine oil.
- Place on main bearing cover (1) and lower thrust ring halves (2).



Ensure that the installation location of the lower bearing shells is free from faults.



- Tighten main bearing cover with rotation angle disc.

 **A02 010**

Observe the tightening sequence:  
From centre main bearing cover outwards.

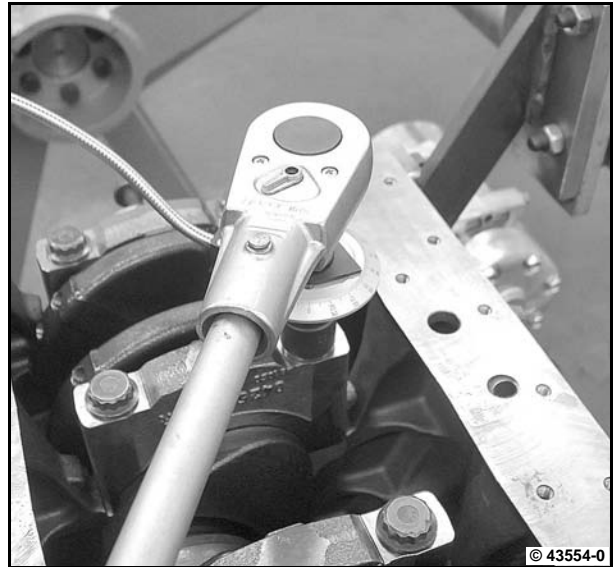
- Install piston and connecting rod.

 **W 02-09-03**

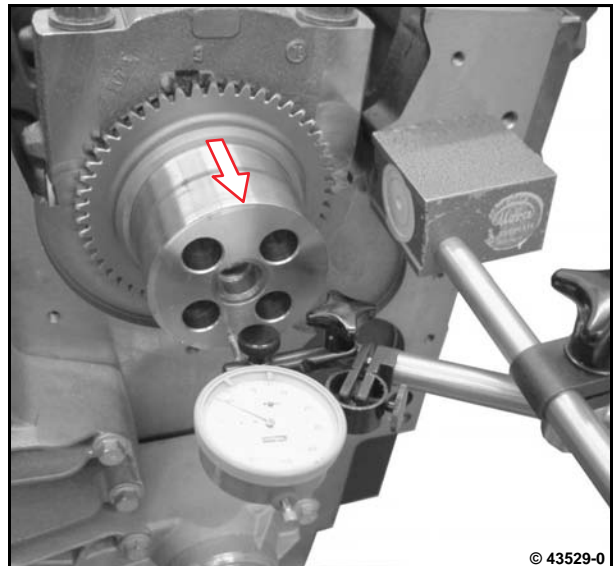
- Install front cover.

 **W 03-08-01**

- Install gearcase.

 **W 04-04-10****6**

- Check axial backlash of crankshaft.

 **W 02-01-04**



## Removing and installing the piston and con rod



Commercial available tools:

- Locking ring pliers

Special tools:

- Assembly device . . . . . 130470
- Piston ring compressor . . . . . 130640
- Liner holder . . . . . 150180



- W 01-04-04
- W 08-04-07



### Attention!

The alignment of the con rod and big end bearing cover must be maintained. If the con rod and the big end bearing cover are installed the wrong way around, the con rod will be useless!

Do not damage the break areas of the con rod and the big end bearing cover!



Collect leaking operating substances in suitable vessels and dispose of according to regulations.

The engine oil and coolant should be added according to the operating manual.

## Removing the piston and con rod

- Drain off engine oil and coolant.



Collect engine oil and coolant and dispose of according to regulations.

- Remove cylinder head.

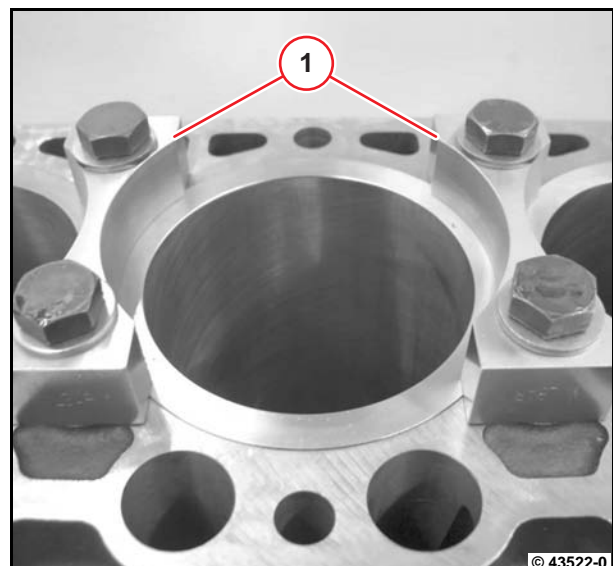
 W 01-04-04

- Remove lubricating oil pan.

 W 08-04-07

- Mount liner holder (1).

- Tighten screws .



- Turn crankshaft until the nuts of the big end bearing cover are completely accessible.
- Remove screws.
- Remove the con rod bearing cover.



**Attention!**

The alignment of the con rod and big end bearing cover must be maintained. If the con rod and the big end bearing cover are installed the wrong way around, the con rod will be useless!

Do not damage the break areas of the con rod and the big end bearing cover!

- Position big end bearing cover in the respective installation location and alignment.



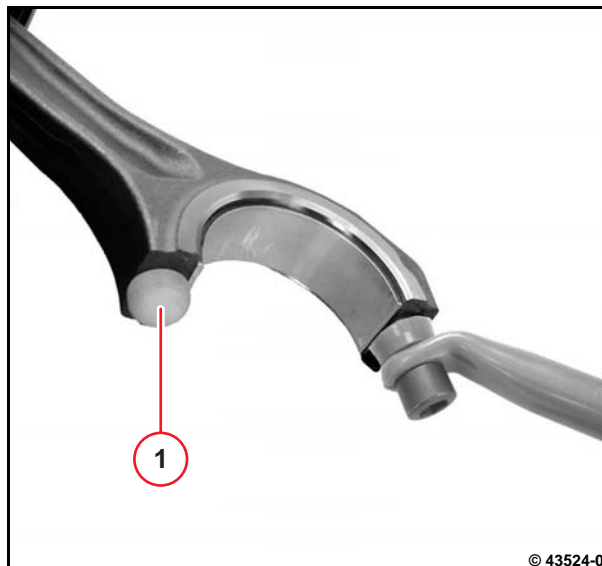
In order to provide a better view the con rod is shown in its uninstalled state.

- Insert protective plug (1) in con rod.
- Mount assembly device on con rod.



**Attention!**

Do not damage the fractured surfaces of the con rod!



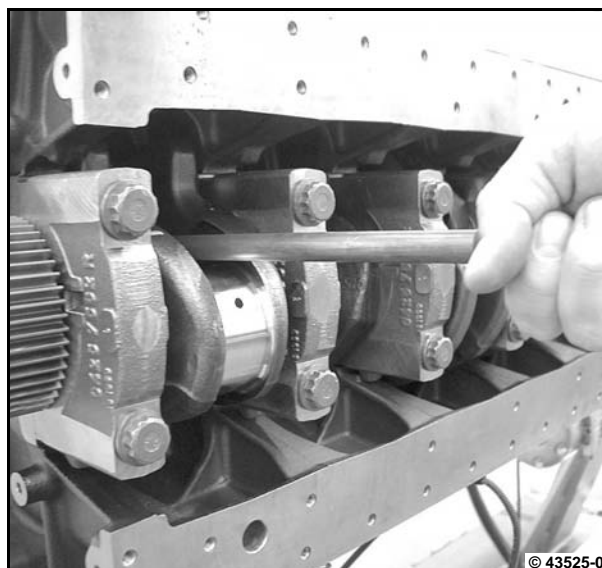
- Press out piston with assembly device.
- Remove assembly device and protective plug.
- Position con rod and piston according to the installation location and alignment.



**Attention!**

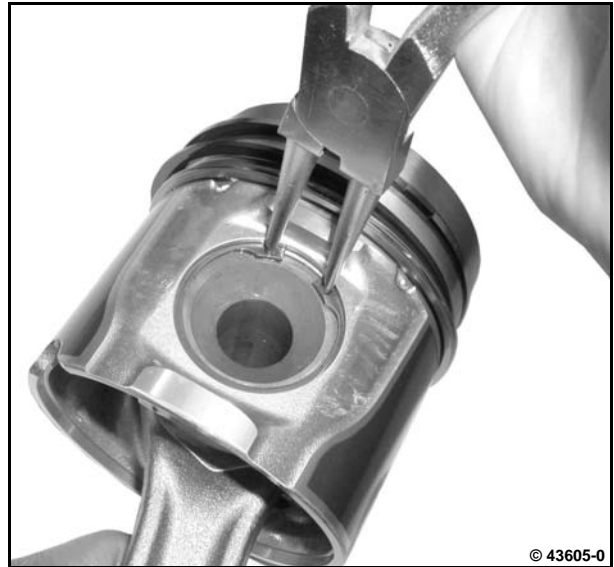
The alignment of the con rod and big end bearing cover must be maintained. If the con rod and the big end bearing cover are installed the wrong way around, the con rod will be useless!

Do not damage the break areas of the con rod and the big end bearing cover!

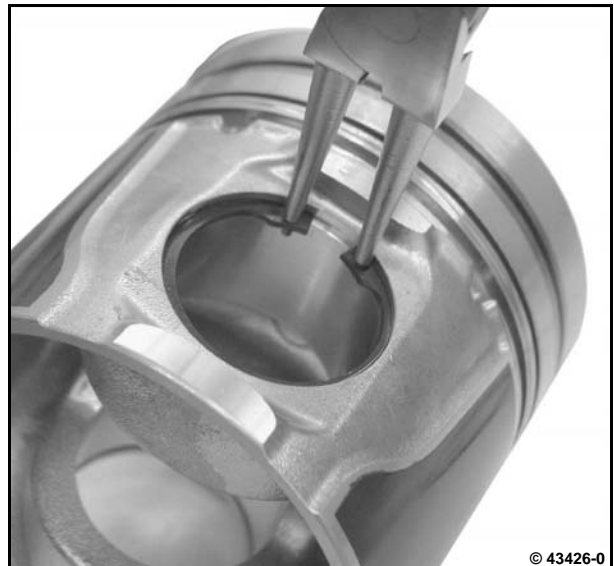




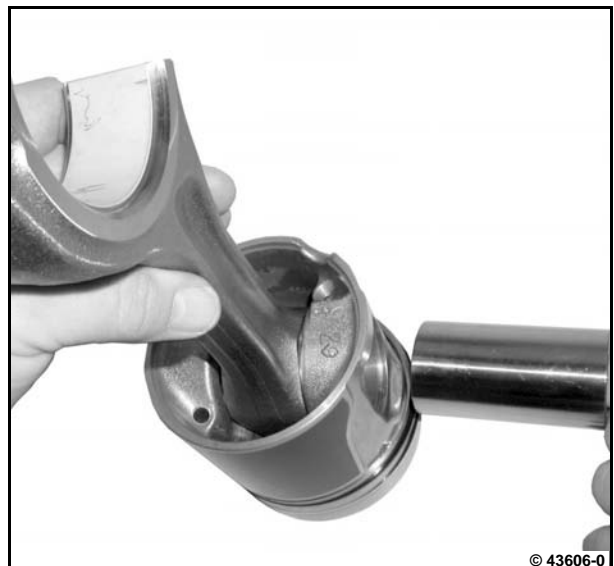
- Remove locking ring with locking ring pliers.
- Press out piston pin.
- Remove locking ring with locking ring pliers.

**6****Installing the piston and con rod**

- Install locking ring with locking ring pliers.



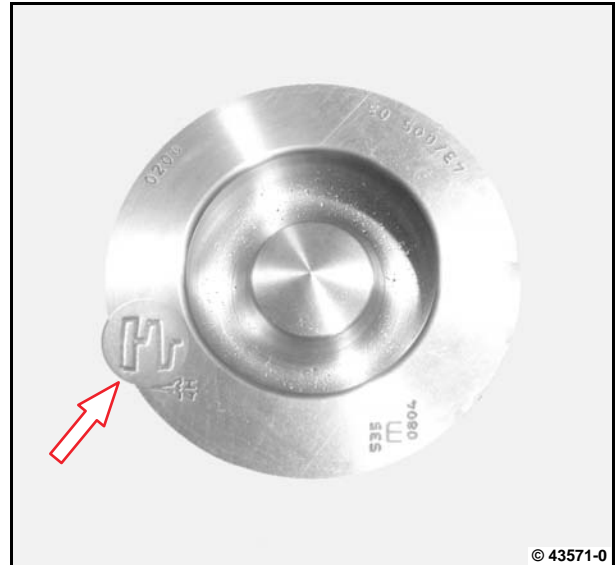
- Insert piston pin in piston.





Thy symbol flywheel/crankshaft (arrow) on the piston base points towards the flywheel.

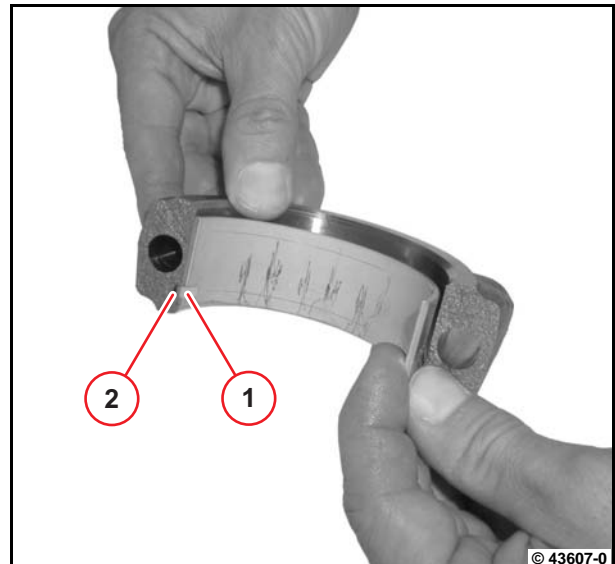
- Insert con rod.
- Press the piston bolt through.
- Install locking ring with locking ring pliers.



- Insert bearing shell in the con rod.



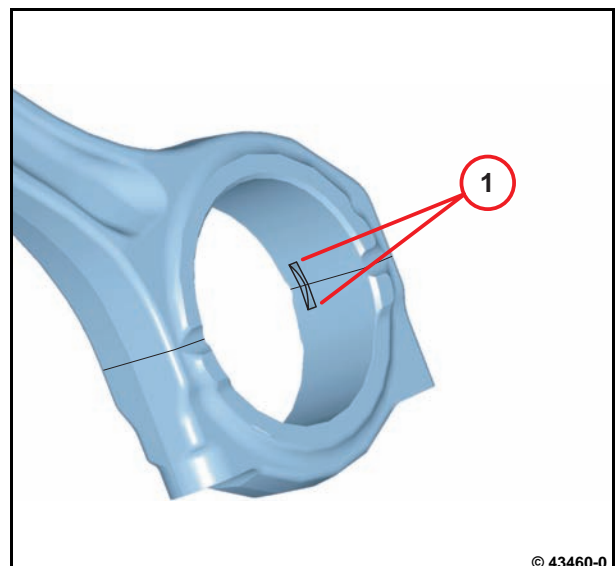
Note the assignment of the bearing shells. The anti-rotation lock (1) must lock in groove (2).



- Insert bearing shell in the respective big end bearing cap.

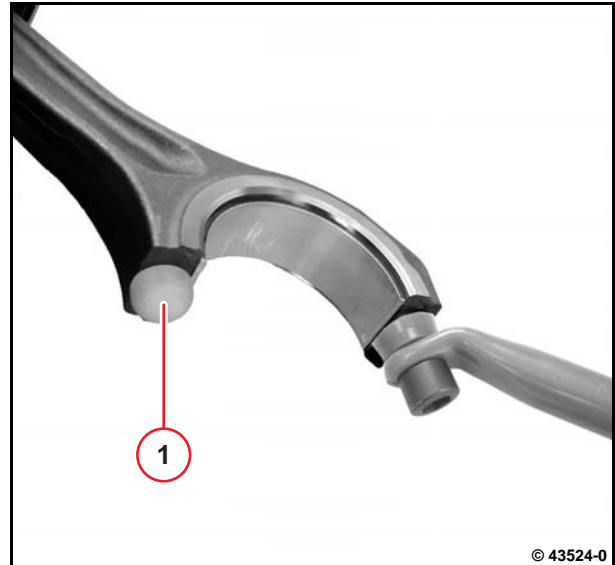


Note the assignment of the bearing shells. The anti-rotation lock must lock in groove (1).





- Insert protective plug (1) in con rod.
- Mount assembly device on con rod.



6

- Lightly oil cylinder running surface, piston, piston rings and lifting bearing journal lightly.



- Position of the piston ring joints:

 P02 95

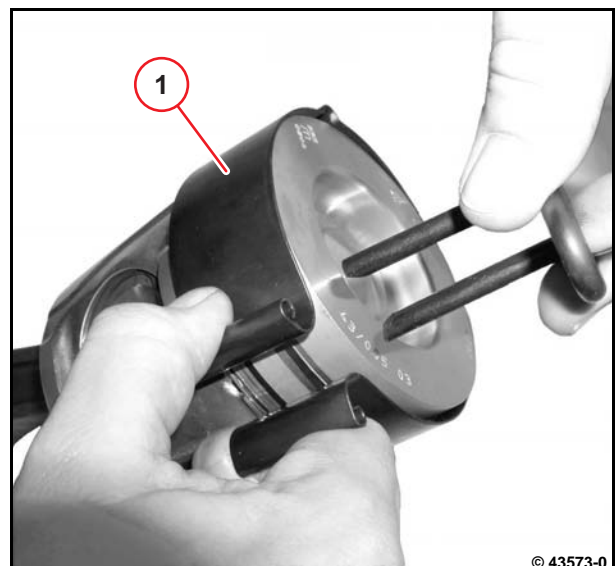
- Position of the spring ring joint:

 P02 96

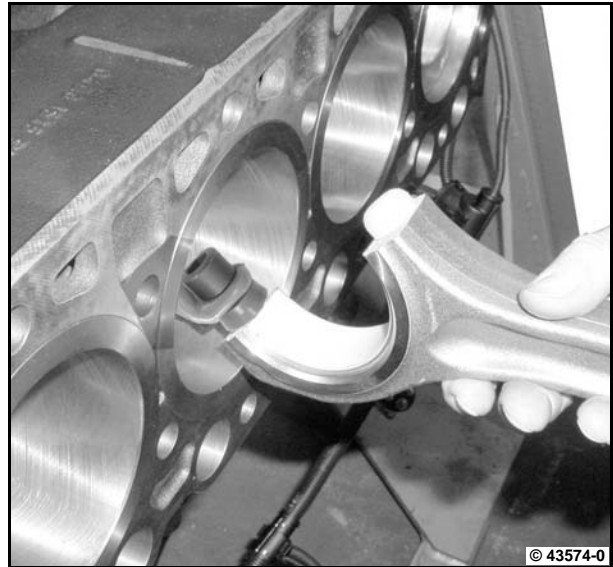


Do not turn the piston rings any further.

- Clamp piston rings with piston ring compressor (1).



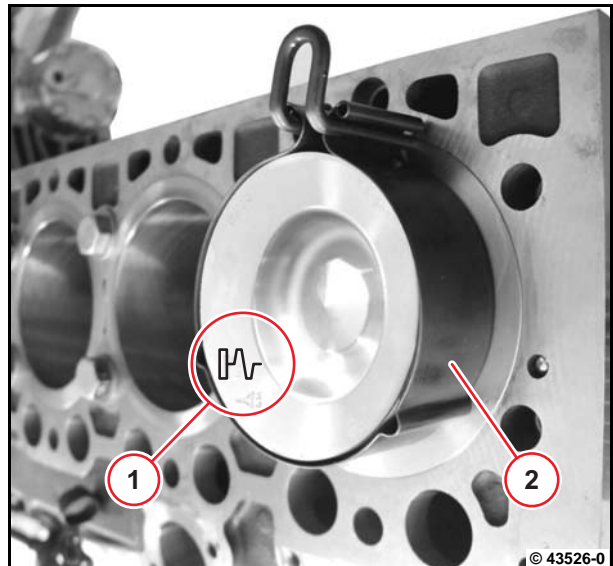
- Position lifting bearing journal in LDC position.
- Push piston and con rod into cylinder liner together with assembly device.



- Push piston completely into cylinder liner.
- Remove piston ring clamping band (2).



Thy symbol flywheel/crankshaft (1) on the piston base points towards the flywheel.

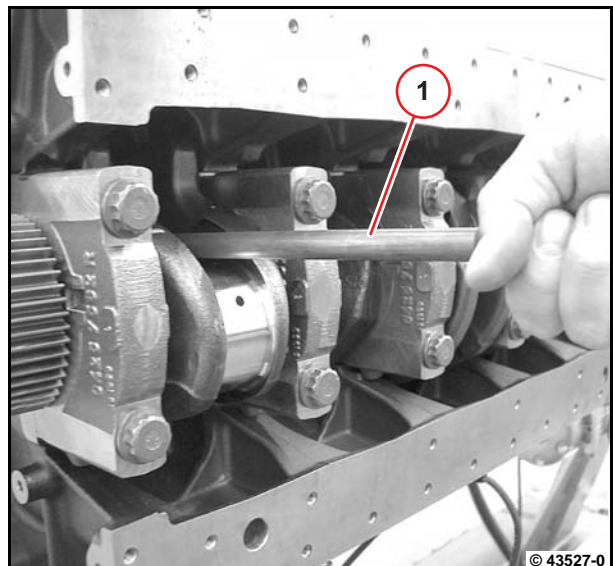


- Pull the con rod with assembly device (1) until it rests on the lifting journal.
- Remove assembly device and protective plug.



**Attention!**

Do not damage the fractured surfaces of the con rod!



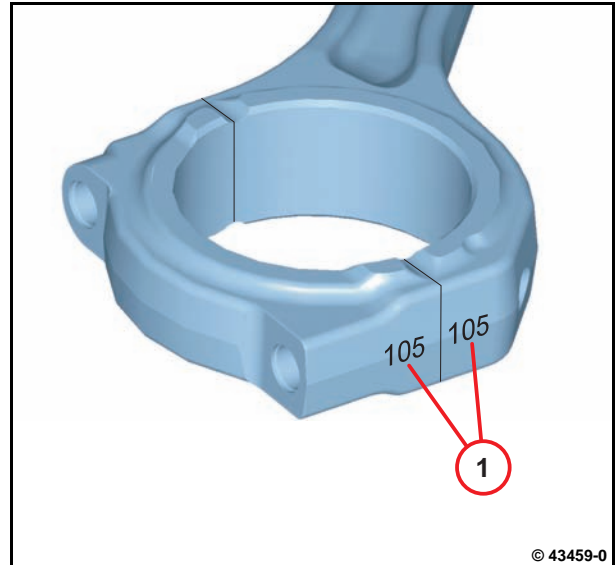
- Install the con rod bearing cover.



### Attention!

Note the assignment of the big end bearing cap.

The identification numbers (1) on the con rod and the big end bearing cap must be identical and opposite to each other when assembled.



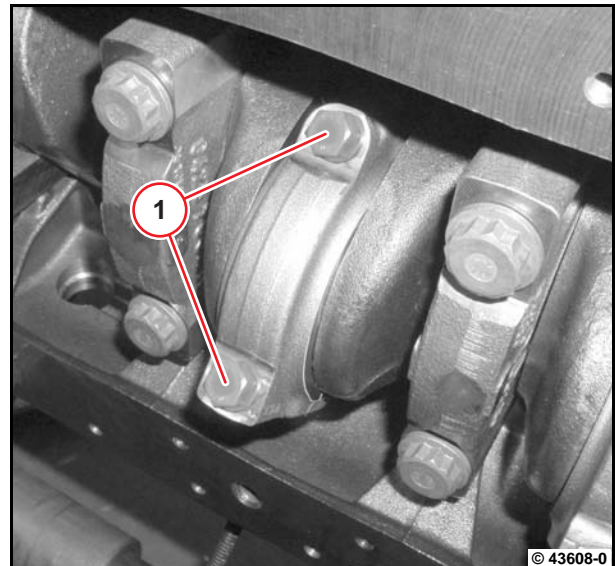
### Attention!

Use new con rod screws.

- Lightly oil screws (1).
- Tighten new screws with the socket wrench insert and rotation angle disc.



A02 020



- Remove liner holder (1).
- Remove cylinder head.

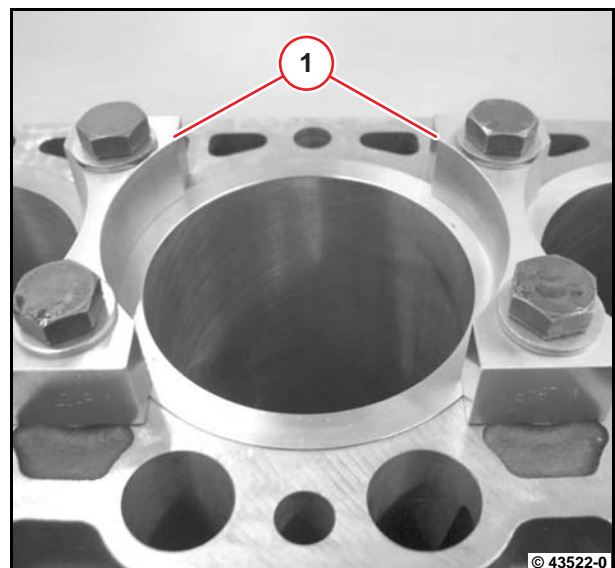


W 01-04-04

- Install lubricating oil pan.



W 08-04-07





## Checking the piston



Commercial available tools:

- Micrometer gauge
- Internal measuring device
- Locking ring pliers

Special tools:

- Dial gauge. . . . . 100400



– W 02-09-03



When the piston wear limit is reached, the piston must be renewed.

## Checking the piston bolt bore

- Remove piston from con rod.



W 02-09-03

- Remove locking ring with locking ring pliers.



- Prepare internal measuring device:

- Mount probe bolt for the appropriate measuring range in the internal measuring device.
- Mount dial gauge with approx. 1 mm pre-tension in the internal measuring device.
- Set micrometer gauge to 45 mm.
- Balance the internal measuring device between the test surfaces of the micrometer gauge and set the dial gauge at the reversal point of the pointer to "0".

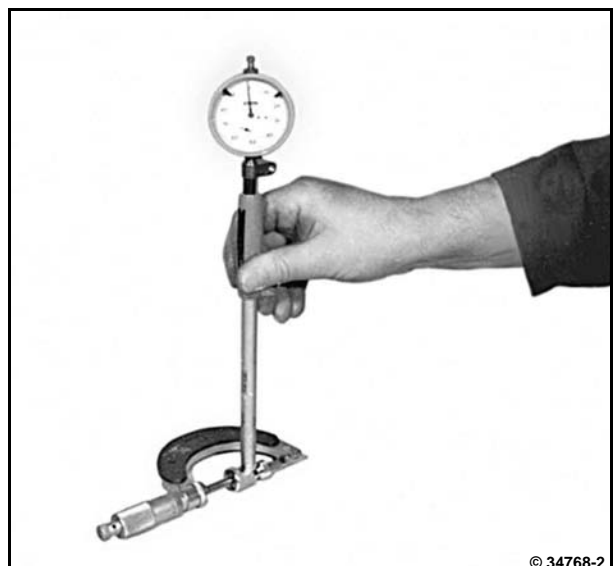
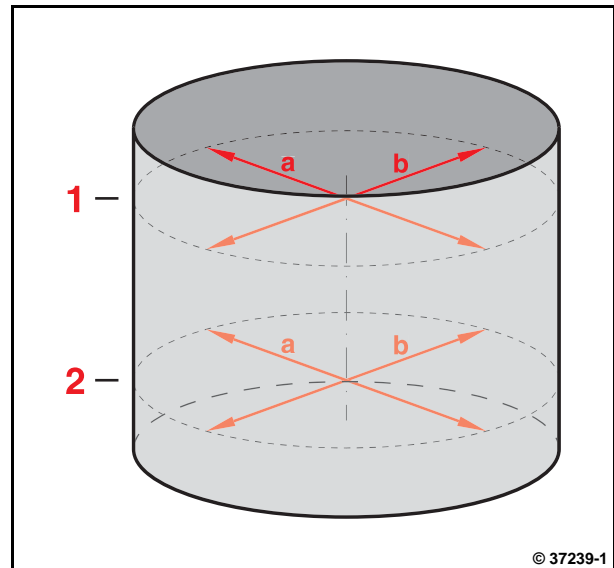




Diagram for measuring the piston bolt bore at the points "a" and "b" in the levels "1" and "2".



- Insert internal measuring device in the piston bolt bore.
- Balance the internal measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.



See schematic diagram for measuring points.



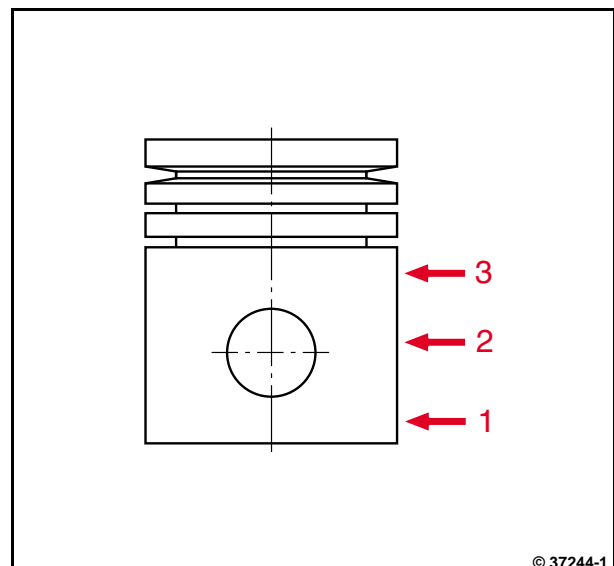
P02 78



## Checking the piston diameter



Diagram for measuring the piston diameter at the measuring points "1, 2 and 3", transverse to the piston bolt bore.



- Measure piston diameter with micrometer gauge.



See schematic diagram for measuring points.



[P02 71](#)

[P02 72](#)

[P02 73](#)

- Assemble con rod and piston.



[W 02-09-03](#)







## Checking the piston rings and piston ring grooves



Commercial available tools:

- Feeler gauges



– W 02-09-03

Special tools:

- Universal piston ring pliers . . . . . 130300
- Trapezoidal groove wear gauge . . . . . 130420

### Checking the piston rings and piston ring grooves

- Remove piston from con rod.



W 02-09-03

- Set universal piston ring pliers to the piston diameter.
- Remove piston rings with universal piston ring pliers.



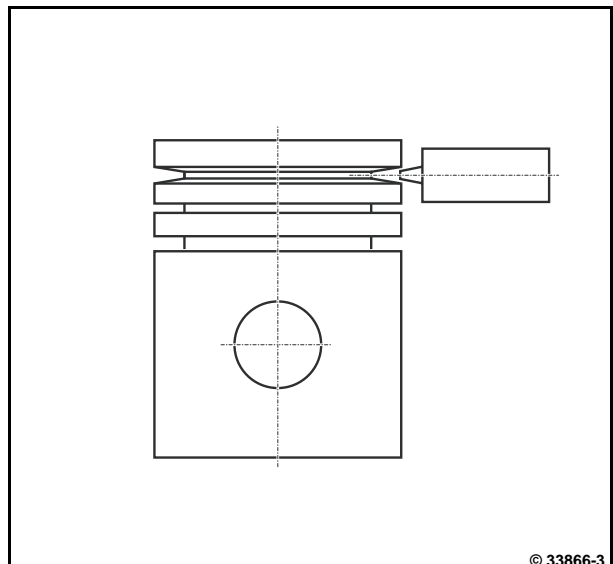
P02 71

- Clean piston.
- Visually inspect piston.



© 43421-0

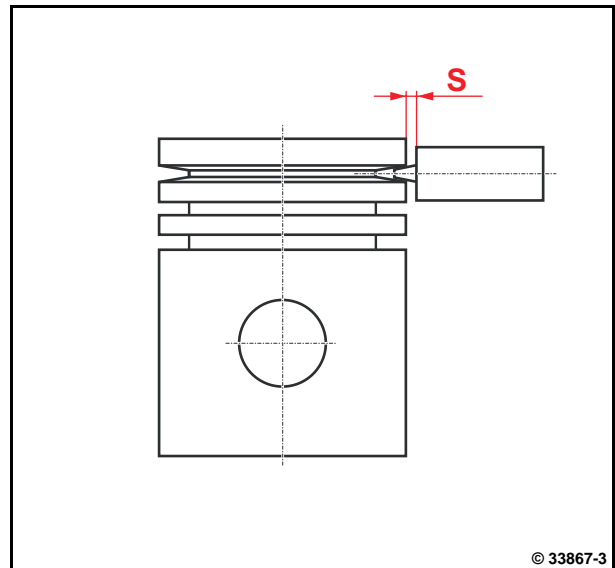
- Measure piston ring groove for first piston ring with trapezoidal groove wear gauge.



© 33866-3



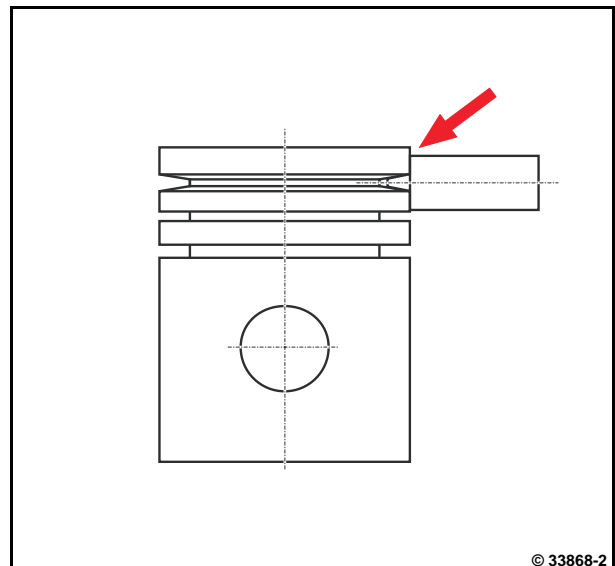
If there is a gap "S" between the trapezoidal groove wear gauge and piston, the piston can be used again.



6



If the trapezoidal groove wear gauge is touching the piston (arrow), the piston must be changed.



## Checking the piston ring joint clearance

- Insert the piston ring in the cylinder.



Align the piston ring in the cylinder by pushing the piston (1).



- Measure the piston ring joint clearance with a feeler gauge.



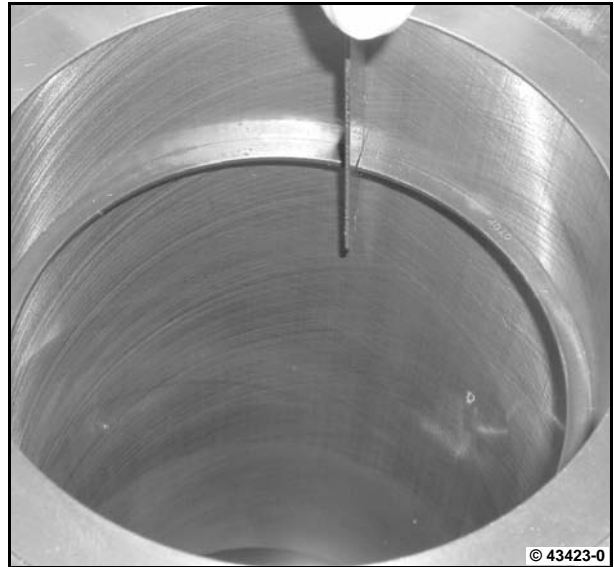
When the wear limit is reached, the piston ring must be renewed.



P02 84

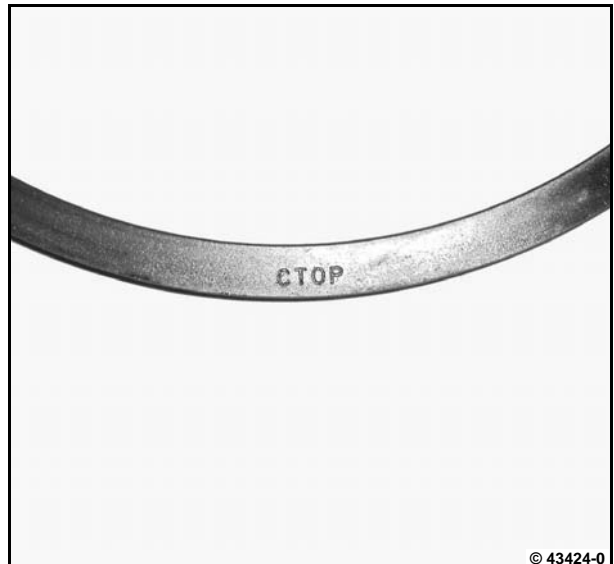
P02 85

P02 86



6

- Mount the piston rings with the marking "TOP" facing the combustion chamber.



- Install piston rings with universal piston ring pliers.



Set spring joint of the bevelland-edge oil control ring 180° to the ring joint.



## Checking the piston ring axial clearance



Only measure piston ring groove 2 and 3.  
Piston ring groove 1 is checked with trapezoidal groove wear gauge.

- Check axial clearance with feeler gauge (1) between piston ring and piston ring groove.



Check with new piston rings.

When the piston wear limit is reached, the piston must be renewed.



P02 87

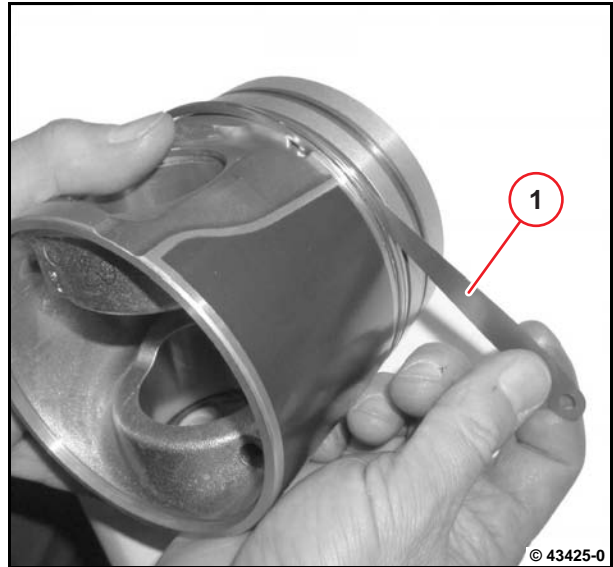
P02 88

P02 89

- Install piston and connecting rod.



W 02-09-03



© 43425-0

## Removing and installing the crankcase bleeding



Commercial available tools:

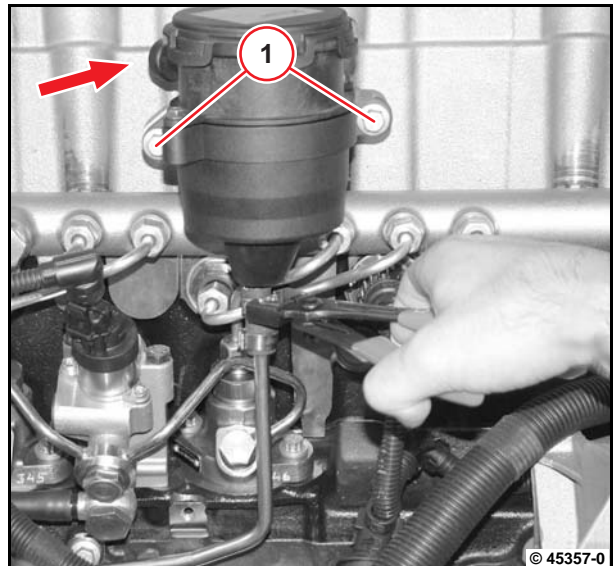
- Hose clip pliers . . . . . 8011
- Spring band pliers . . . . . 9090

Special tools:

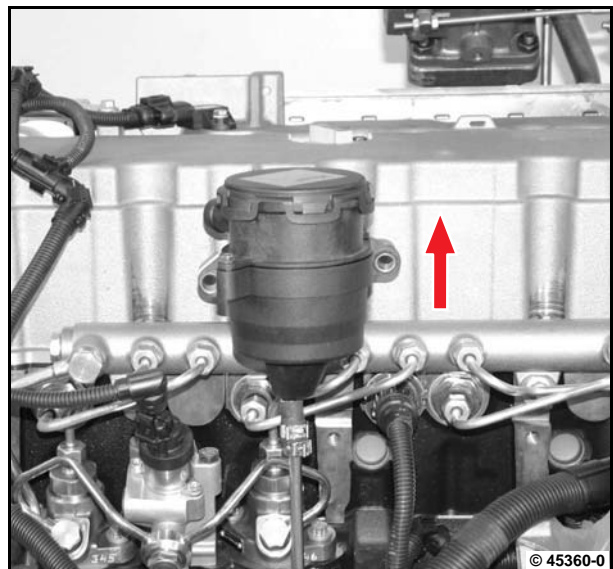
- Disassembly tool . . . . . 110901

### Removing the crankcase bleeding

- Unscrew screws (1).
- Remove hose pipe (arrow).
- Release hose clip with hose clip pliers and pull down.



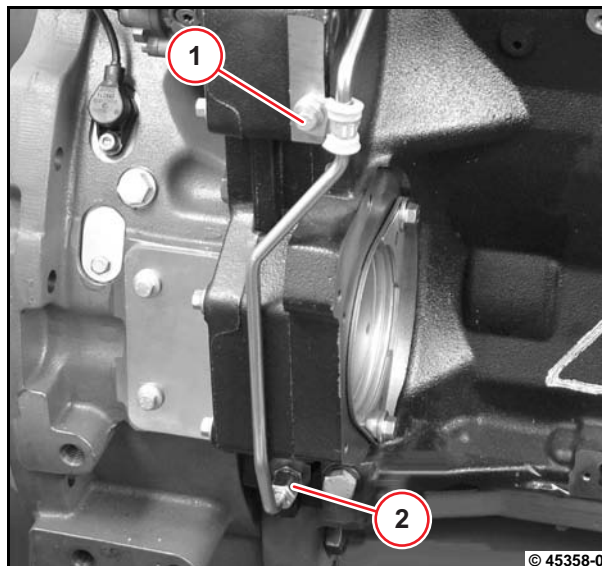
- Pull the housing of the crankcase breather out of the hose connection.



- Remove gasket with disassembly tool.



- Remove pipe clip (1).
- Unscrew lock nut (2).



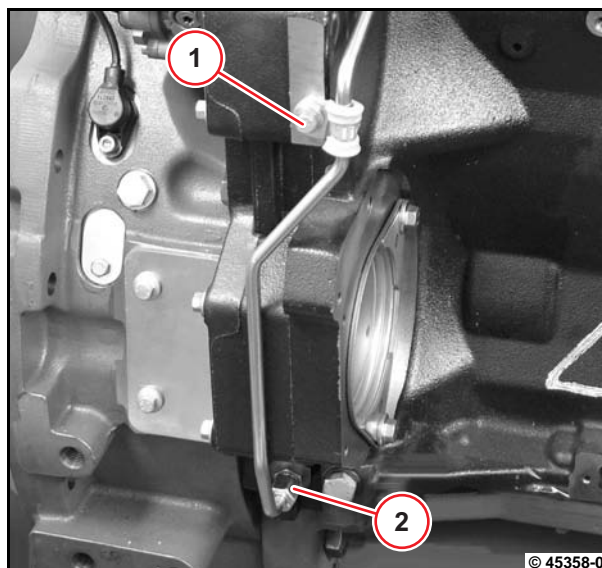
### **Install crankcase bleeding**

- Tighten lock nut (2).

 **A03 062**

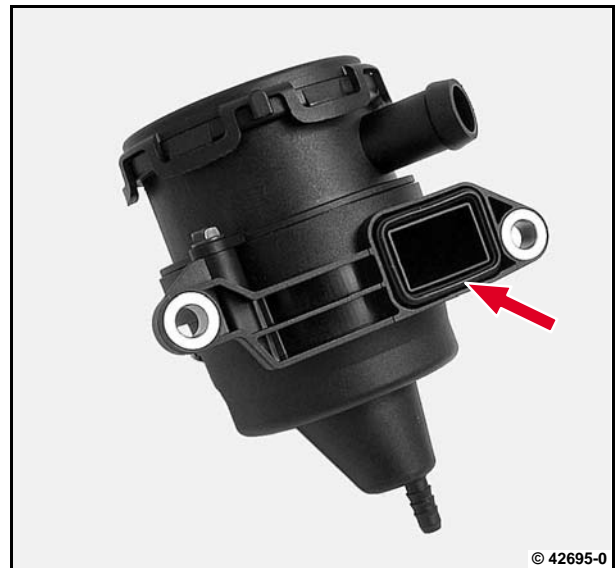
- Tighten pipe clip (1).

 **A03 064**



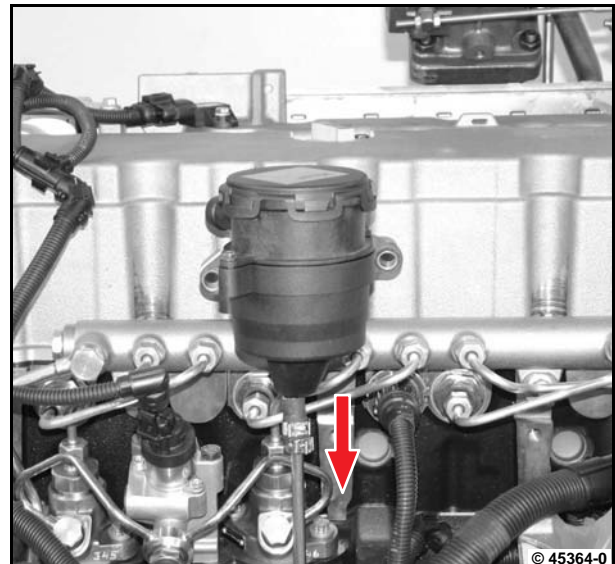


- Insert new gasket (arrow).



6

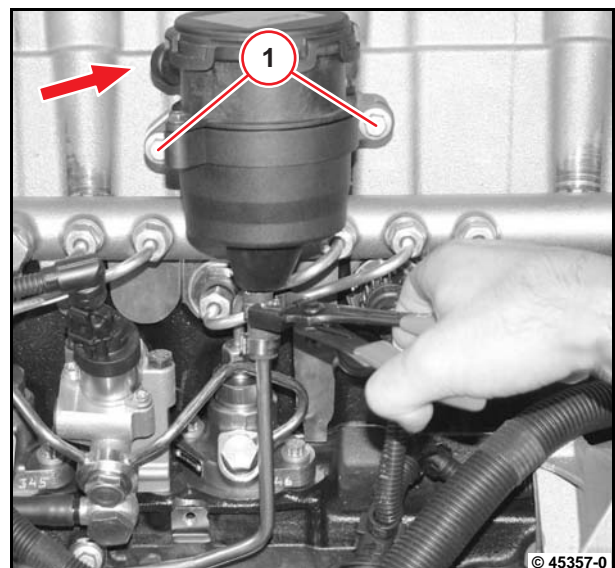
- Plug the housing of the crankcase breather into the hose connection.



- Tighten screws (1).

 A03 060

- Install hose pipe (arrow).
- Fix the hose clip with the hose clip pliers.







## Dismantling and assembling the crankcase breather



Commercial available tools

Special tools:

– Disassembly tool. . . . . 110901

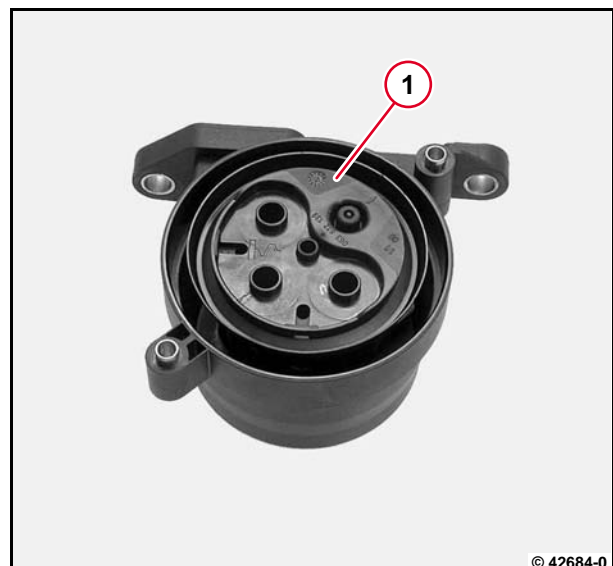
**6**

### Disassembling the crankcase breather

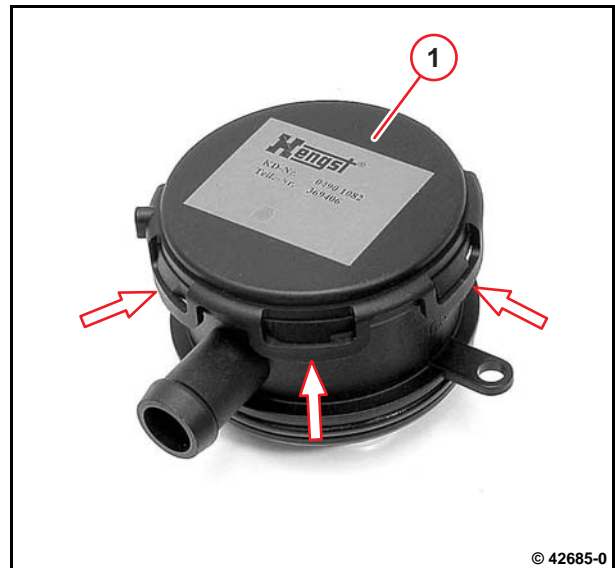
- Unscrew screws (1).
- Remove housing top (2).



- Remove insert (1).



- Unclip all holding brackets (arrows).
- Remove housing cover (1).



- Remove diaphragms (1).
- Clean components.
- Check components for visible signs of wear.



### Assembling the crankcase breather

- Insert spring.
- Insert diaphragms.



Ensure that the installation location is free from faults.



- Clip on housing cover.



Ensure that the installation location is free from faults.



6

- Mount new O-ring (1).
- Lightly oil O-ring.



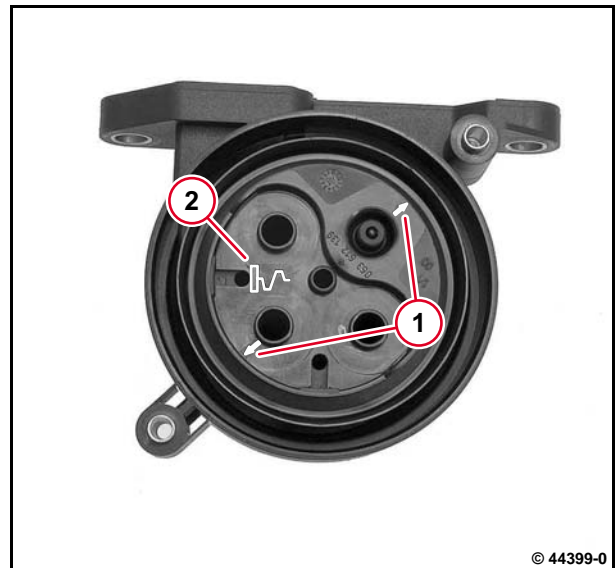
- Mount new O-ring (1).
- Lightly oil O-ring.



- Push insert into bottom part of housing.



The arrows (1) face the threaded bushes.  
The symbol (2) faces the flywheel.



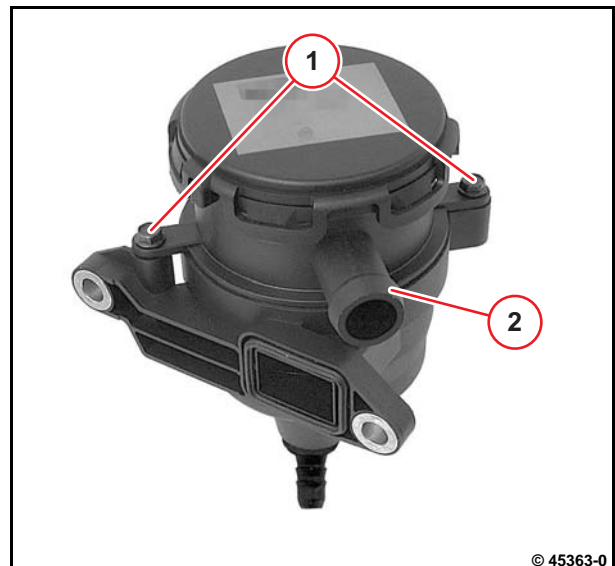
- Insert housing top.
- Tighten screws (1).



**A03 069**



Hose nozzle (2) faces the fastening flange.



## Testing the cylinder liner



Commercial available tools:

- Internal measuring device
- Micrometer gauge

Special tools:

- Dial gauge. . . . . 100400



– W 01-04-04

– W 02-09-03

## Testing the cylinder liner

- Remove cylinder head.



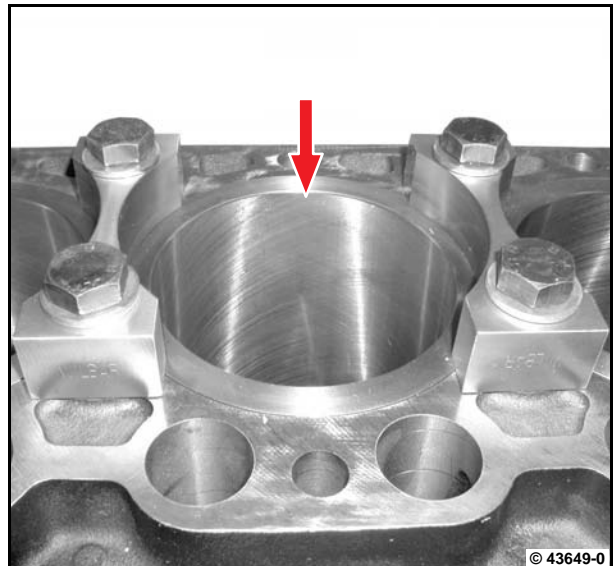
W 01-04-04

- Check cylinder for visible signs of wear.

- Remove piston and connecting rod.



W 02-09-03



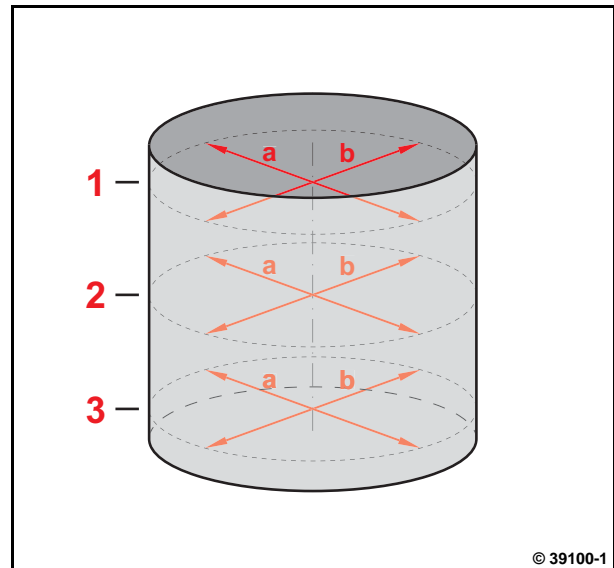
- Prepare internal measuring device:

- Mount probe bolt for the appropriate measuring range in the internal measuring device.
- Mount dial gauge with approx. 1 mm pre-tension in the internal measuring device.
- Set micrometer gauge to 108 mm.
- Balance the internal measuring device between the test surfaces of the micrometer gauge and set the dial gauge at the reversal point of the pointer to "0".





Diagram for measuring the cylinder running surface at the points "a" and "b" in the levels "1" - "3".



**6**

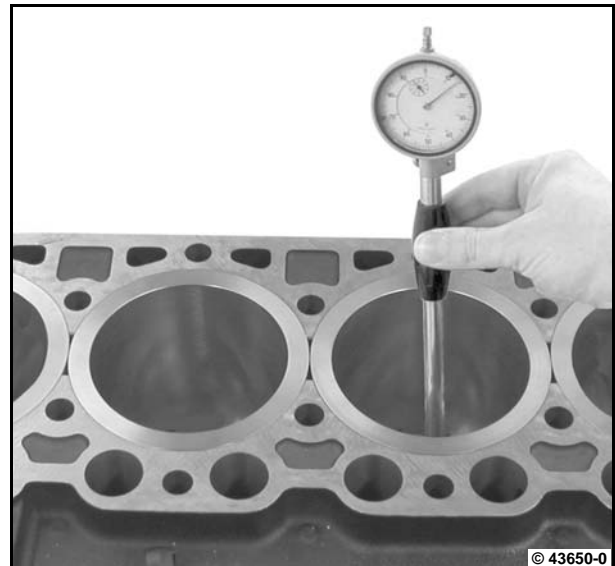
- Insert internal measuring device in cylinder.
- Balance the internal measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.
- Compare nominal values.



**P03 31**



When the wear limit is reached, the cylinder liner must be renewed.



## Removing and installing the cylinder liner



Commercial available tools

Special tools:

- Extraction tool . . . . . 150170
- Plate . . . . . 150171
- Assembly lever . . . . . 150190
- Washer . . . . . 150191



- Fitting compound  
DEUTZ AP1908



- W 02-09-03
- W 03-03-08



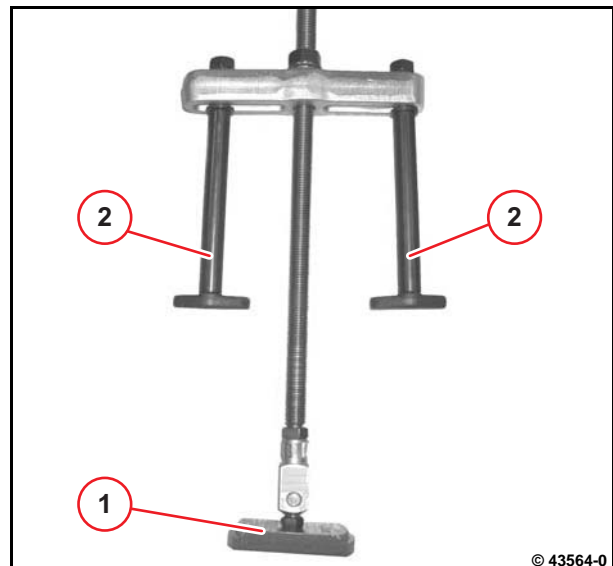
Collect leaking operating substances in suitable vessels and dispose of according to regulations.  
The engine oil and coolant should be added according to the operating manual.

### Removing the cylinder liner

- Remove piston and connecting rod.

 W 02-09-03

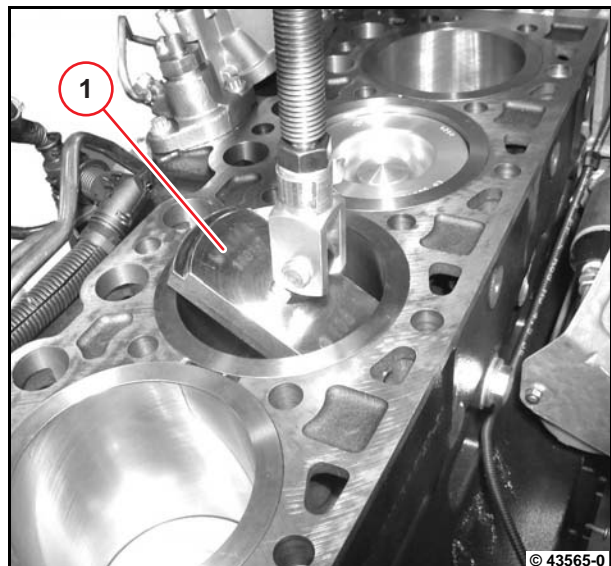
- Pre-mount the disassembly device
  - Mount the plate (1) on the disassembly device
  - Adapt the counter support (2) according to the diameter of the cylinder liner.



- Fold the plate (1) to the side and insert the disassembly device in the cylinder liner.

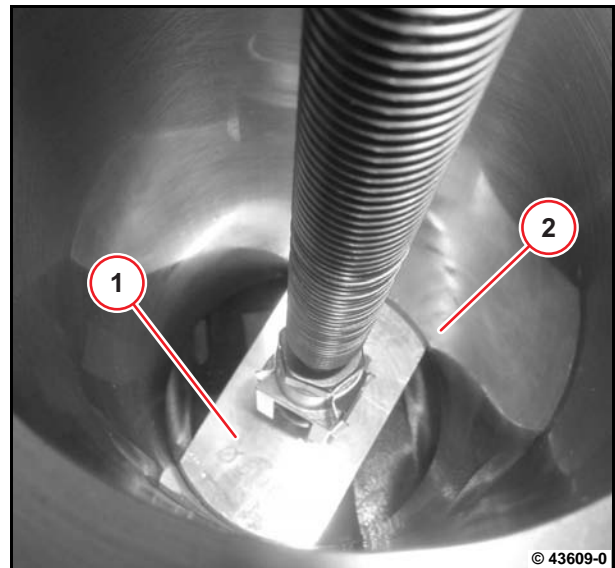


Make sure that the running surface and the sealing surface are not damaged.  
Pay attention to the piston cooling nozzle.

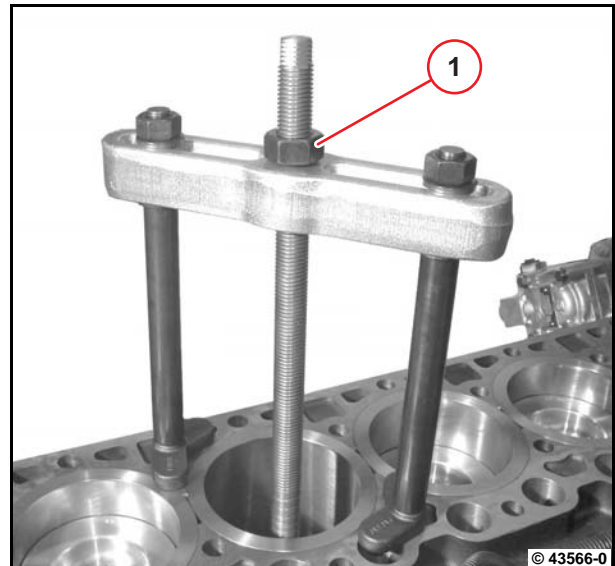




- Place the plate (1) with the lay-on surfaces against the cylinder liner (2) and hold them together.



- Turn the nut (1) clockwise.



- Pull the cylinder liner up and out.
- Remove disassembly device.
- Remove the O-rings from the cylinder liner.





## Install cylinder liner

- Clean cylinder liner.
- Insert new O-rings.

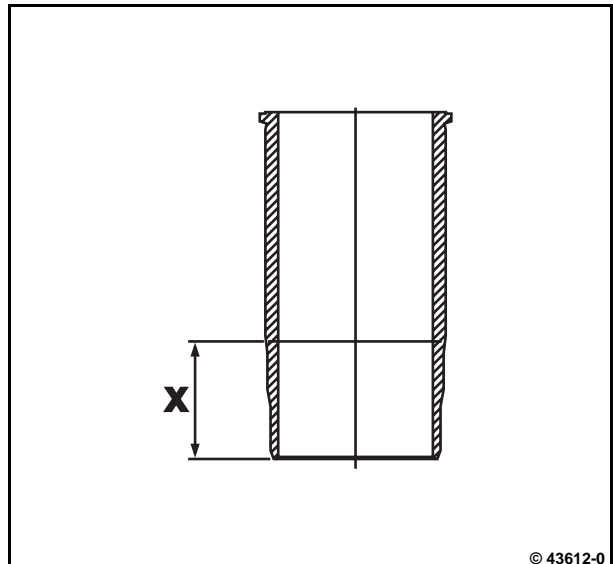


6

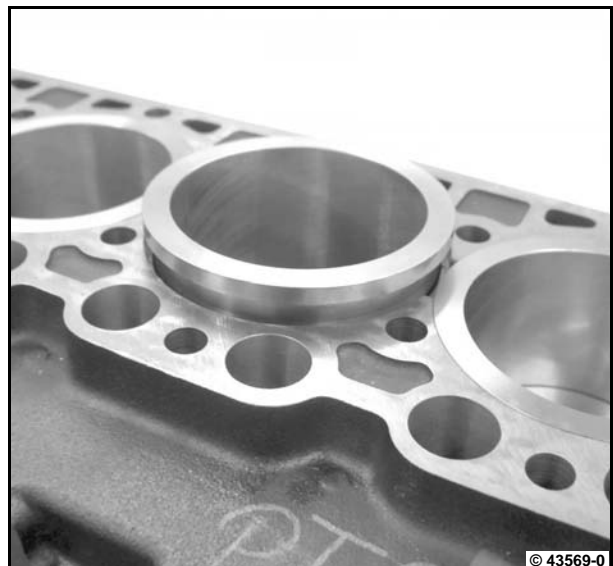
- Coat the cylinder liner in the "X" area with fitting compound.



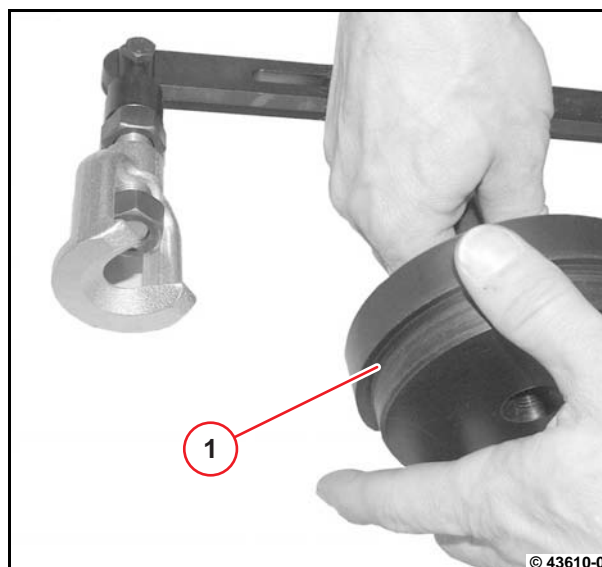
Make sure that the liner surface and the crankcase are absolutely clean before installing the cylinder liner.



- Insert the cylinder liner in the crankcase.



- Select the pressing disc (1) according to the diameter of the cylinder liner and screw to the assembly lever.

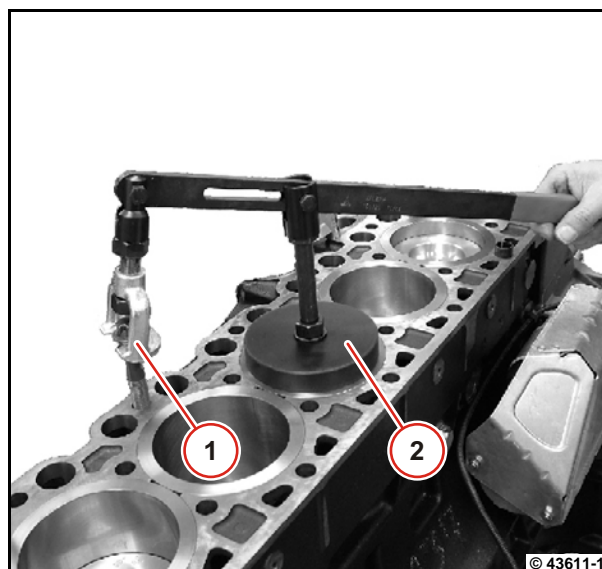


- Screw in a cylinder head screw.
- Hook assembly lever (1) to cylinder head screw.
- Mount disc (2) on cylinder liner.
- Press in the cylinder liner to the stop with the assembly lever.
- Remove assembly lever.
- Check the overhang of the cylinder liner.

 [W 03-03-08](#)

- Install piston and connecting rod.

 [W 02-09-03](#)



## Checking the overhang of the cylinder liner



Commercial available tools

Special tools:

- Dial gauge. . . . . 100400
- Measuring device . . . . . 100750



– W 01-04-04

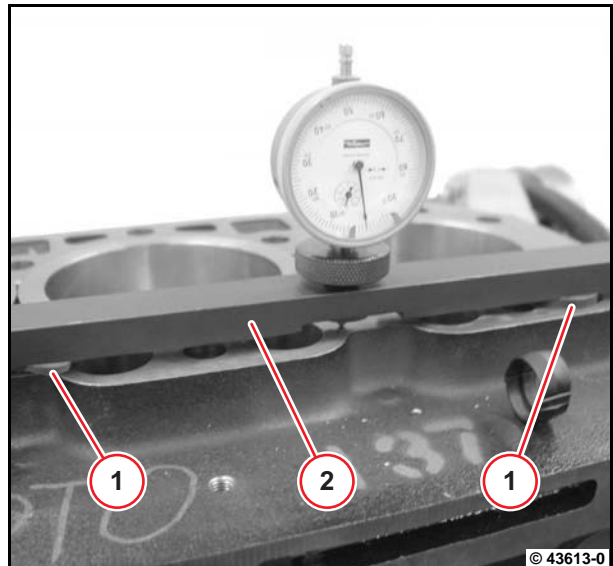
### Checking the overhang of the cylinder liner

- Remove cylinder head.

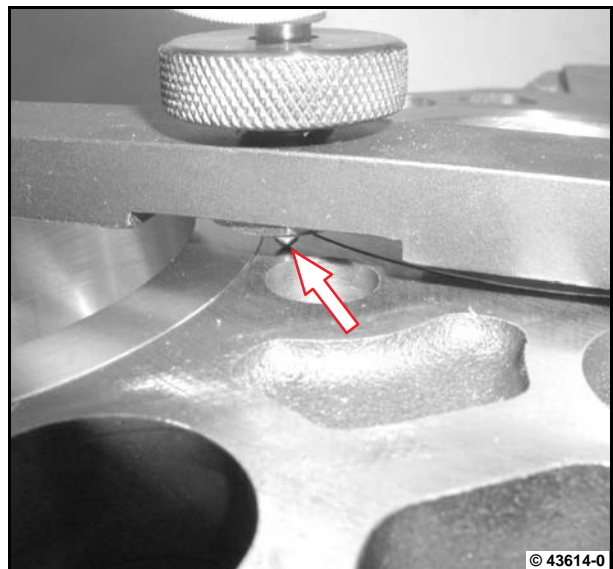


W 01-04-04

- Insert dial gauge into measuring beam.
- Place shims (1) and measuring beam (2) on the sealing surface of the crankcase.



- Apply stylus of the meter to the crankcase sealing surface with pre-stressing (arrow).
- Adjust meter to "0".



- Move the measuring beam and spacing washers until the stylus (arrow) is touching the sealing surface of the cylinder liner.



P03 39

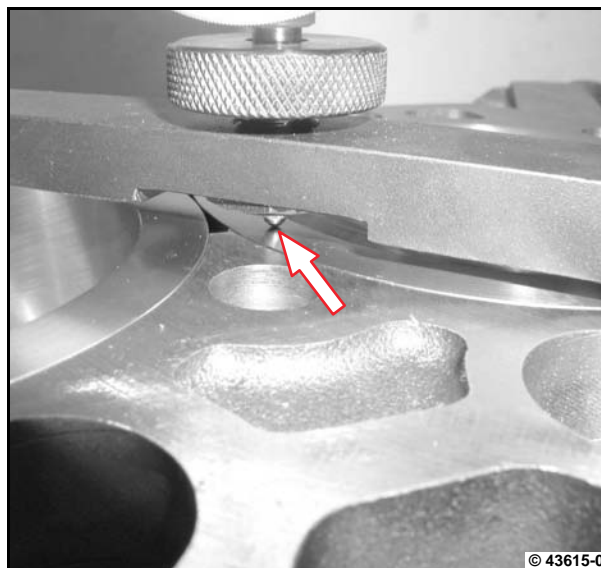


Make measurements at at least 3 other points on the cylinder liner.

- Install cylinder head.



W 01-04-04



## Removing and installing the front cover (opposite side to flywheel)



Commercial available tools



– W 02-02-04  
– W 08-04-07  
– W 12-01-04



– Packing compound  
DEUTZ DW 67

### Remove the front cover

- Removing torsional vibration damper.



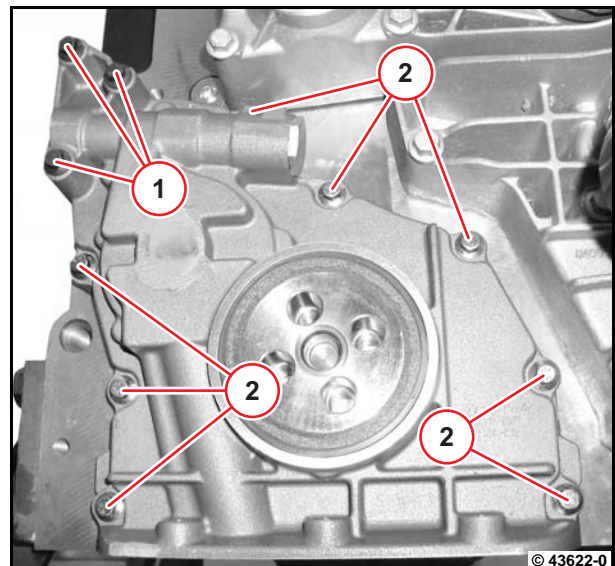
W 12-01-04

- Remove lubricating oil pan.



W 08-04-07

- Unscrew screws (1).
- Unscrew screws (2).
- Remove front cover.



- Visually inspect the components.
- Knock out crankshaft sealing ring (1).



### Attention!

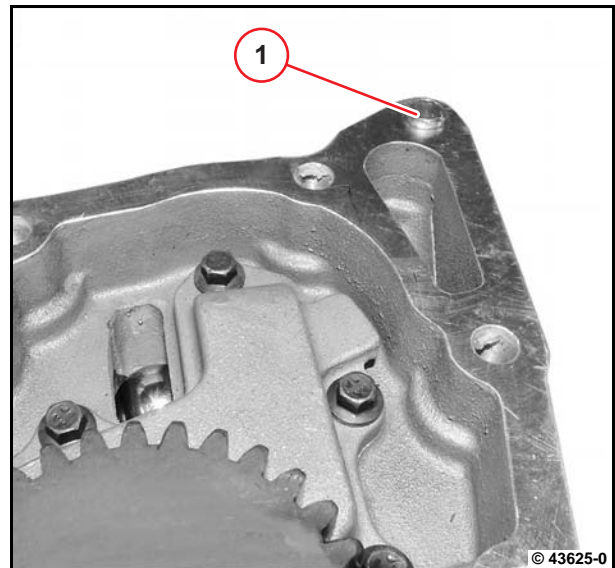
Do not damage sealing surface when knocking out.



## Install front cover



Make sure the clamping bushing (1) is in place.

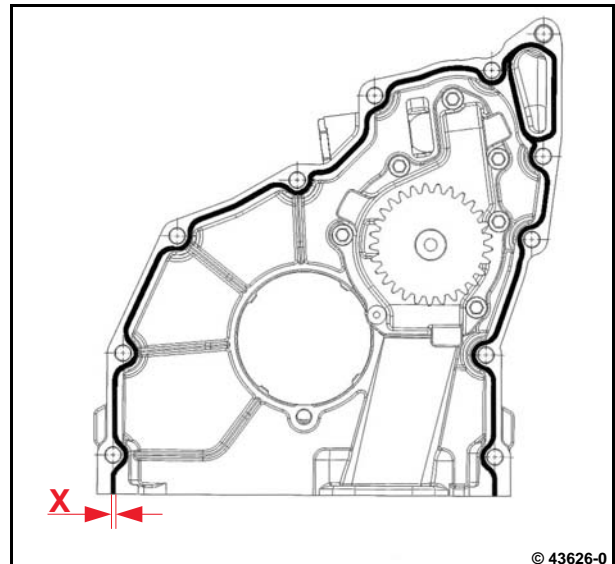


© 43625-0

- Clean sealing surfaces.
- Coat sealing surfaces with sealant before inserting.



Sealant width "X" = approx. 2 mm.

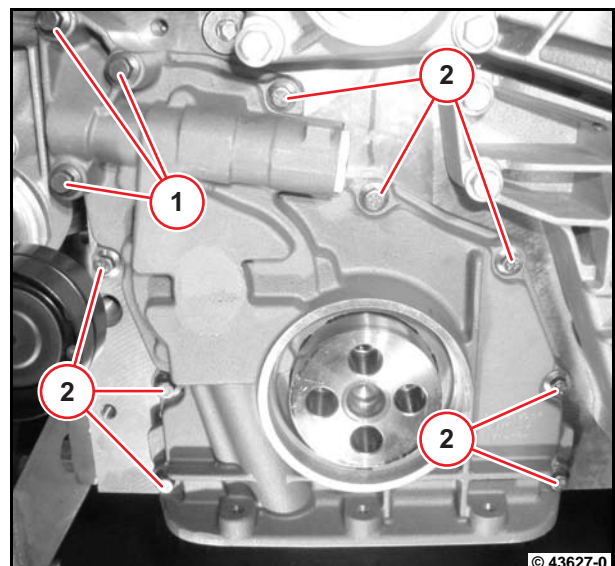


© 43626-0

- Mount front cover.
- Tighten screws (1) and (2) evenly.



**A03 020**



© 43627-0

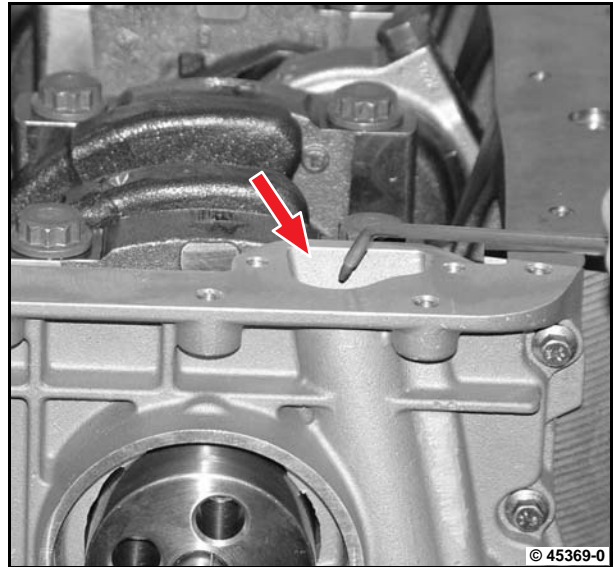


- Turn the engine on the assembly block.



Crankshaft on top.

- Fill engine oil into the oil pump housing.

**6**

- Install crankshaft sealing ring.



[W 02-02-04](#)

- Install lubricating oil pan.



[W 08-04-07](#)

- Install torsional vibration damper.



[W 12-01-04](#)







## Removing and installing the connection housing



Commercial available tools



– W 05-07-01  
– W 12-06-01  
– W 13-03-02

6

### Removing the connection housing

- Install impulse transmitter (crankshaft).

 W 05-07-01

- Remove starter.

 W 13-03-02

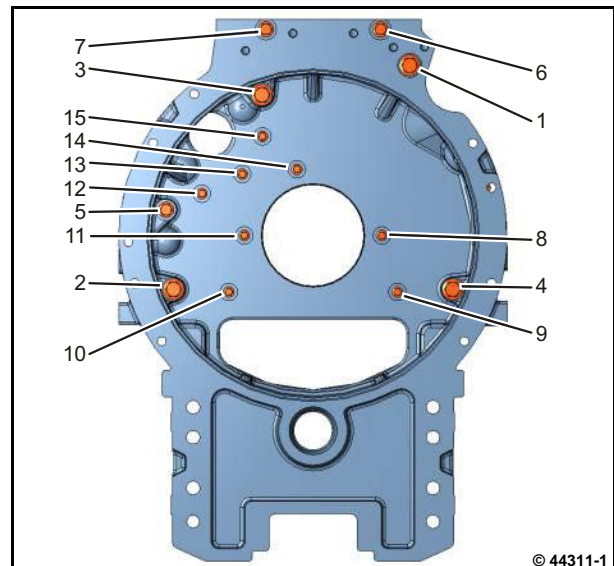
- Remove flywheel.

 W 12-06-01

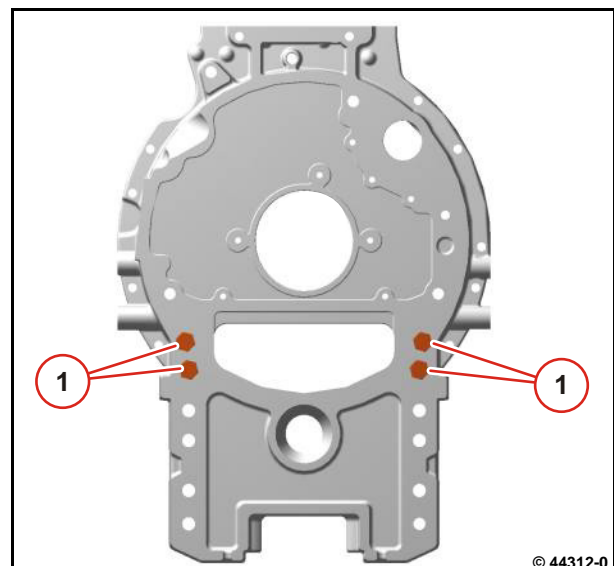
- Remove screws.



Loosen the screws in the specified order.  
Note different screw lengths.

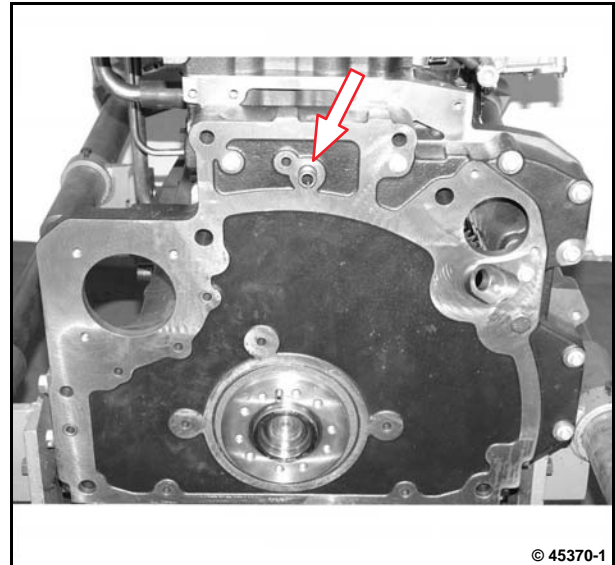


- Hook connection housing to workshop crane.
- Unscrew screws (1).
- Remove connection housing.
- Visually inspect the components.
- Unhook workshop crane.



## Installing the connection housing

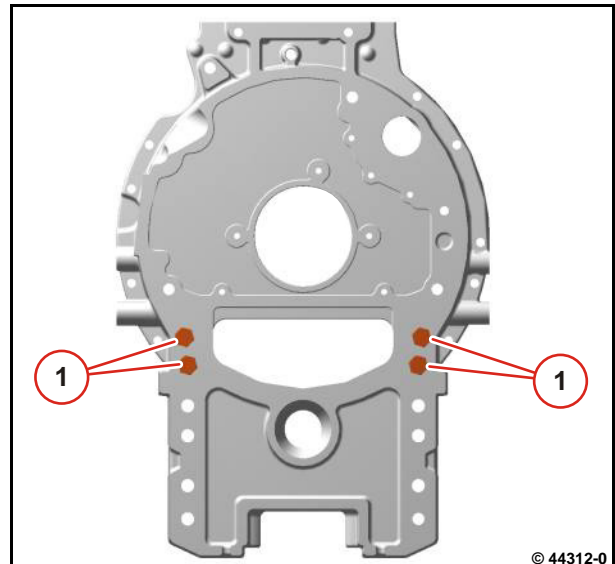
- Clean contact surfaces.
- Make sure the clamping bushing (arrow) is in place.
- Hook connection housing to workshop crane.



- Mount connection housing.
- Centre connection housing over the clamping bushings.
- Tighten screws (1).

 **A03 083**

- Unhook workshop crane.




- Fasten all screws.



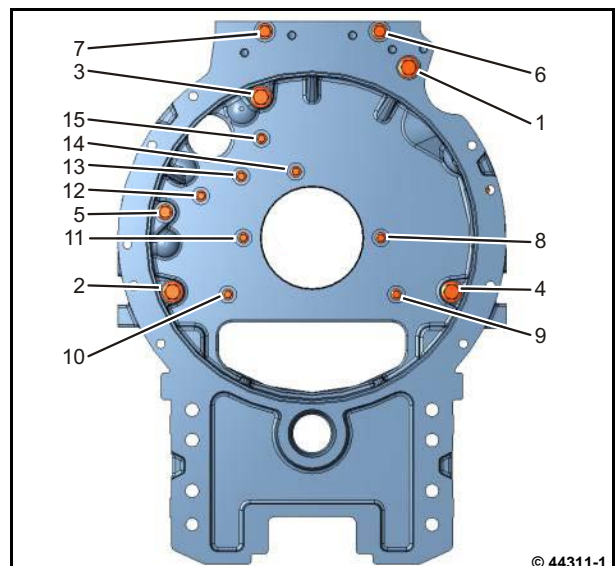
Note different screw lengths.

- Tighten the screws according to the tightening sequence.

 **M8 = A03 080**

**M12 = A03 081**

**M16 = A03 082**



- Make sure the clamping bushing (1) is properly installed.

- Install flywheel.

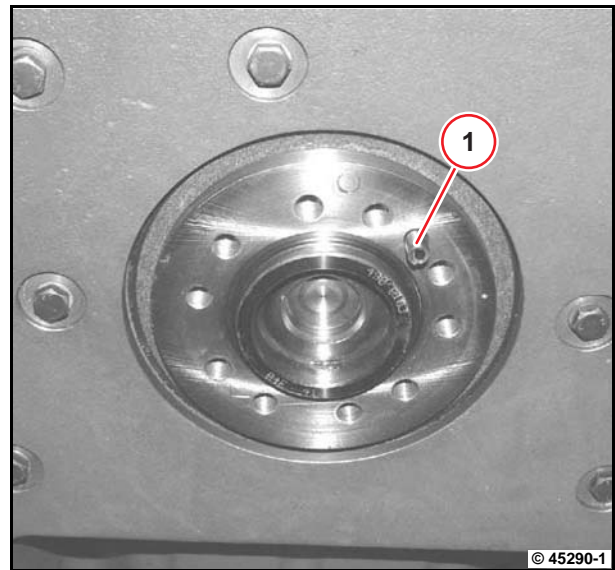
 [W 12-06-01](#)

- Install starter.

 [W 13-03-02](#)

- Install speed governor (crankshaft).

 [W 05-07-01](#)





## Removing and installing the gearcase



Commercial available tools







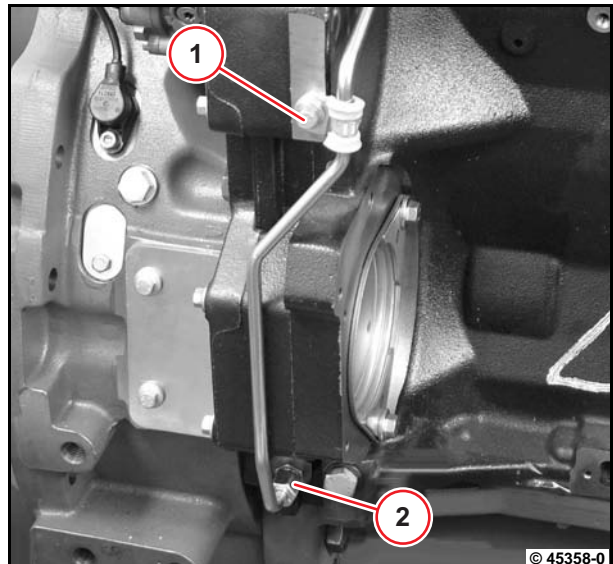
- Packing compound  
DEUTZ DW 67
- Packing compound  
DEUTZ DW 48



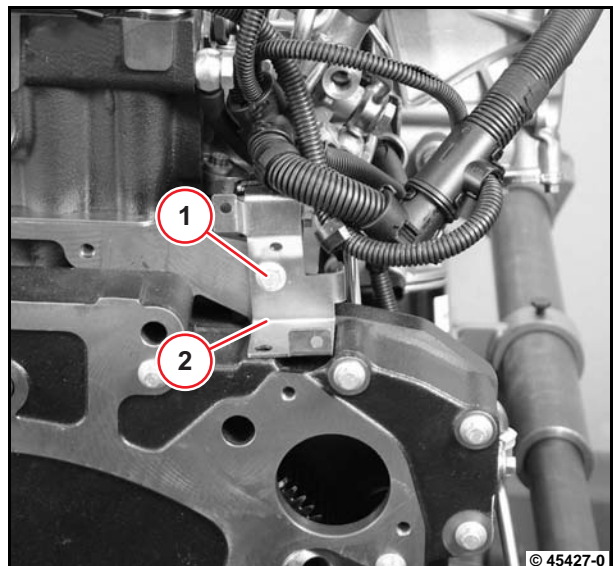
- W 02-02-02
- W 03-09-04
- W 05-07-03
- W 07-11-01
- W 08-04-07
- W 12-06-01
- W 13-03-02

### Removing the gearcase

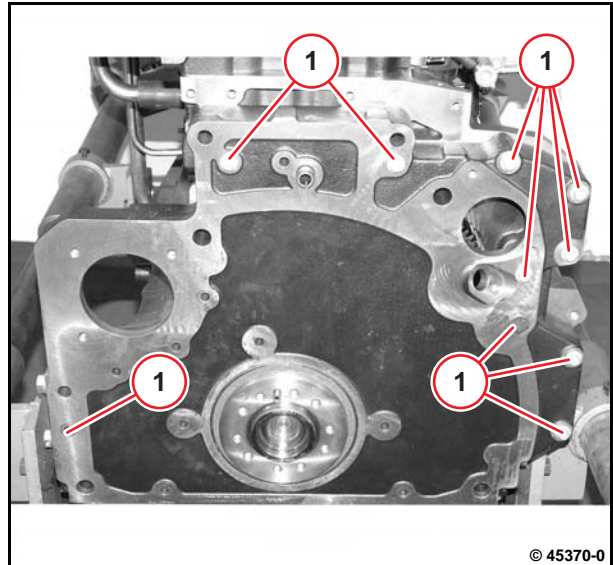
- Remove pipe clip (1).
- Unscrew union nuts (1).
- Remove starter.  
 W 13-03-02
- Remove impulse transmitter (camshaft).  
 W 05-07-03
- Remove fuel supply pump.  
 W 07-11-01
- Remove connection housing.  
 W 03-09-04



- Unscrew screw (1).
- Remove the holder (2).



- Unscrew all screws (1).
- Remove gearcase.



- Visually inspect the component.

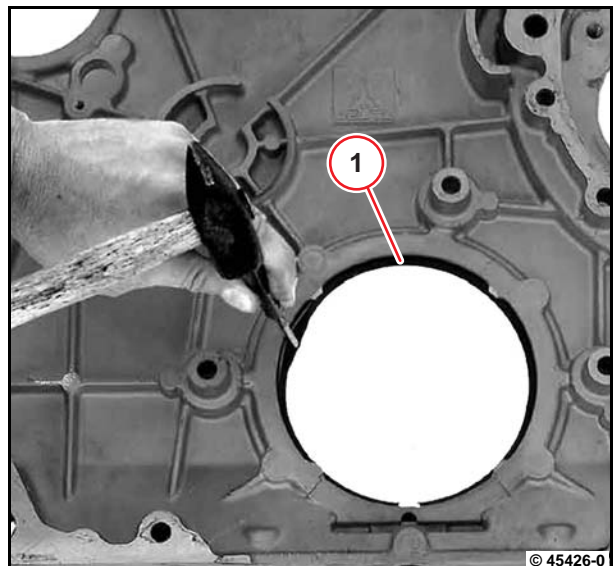


- Knock out crankshaft sealing ring (1).



**Attention!**

Do not damage sealing surface when knocking out.





## Installing the gearcase

- Clean sealing surfaces.



The sealing surfaces must be dry and free from grease and dirt.



- Apply packing compound (arrow).

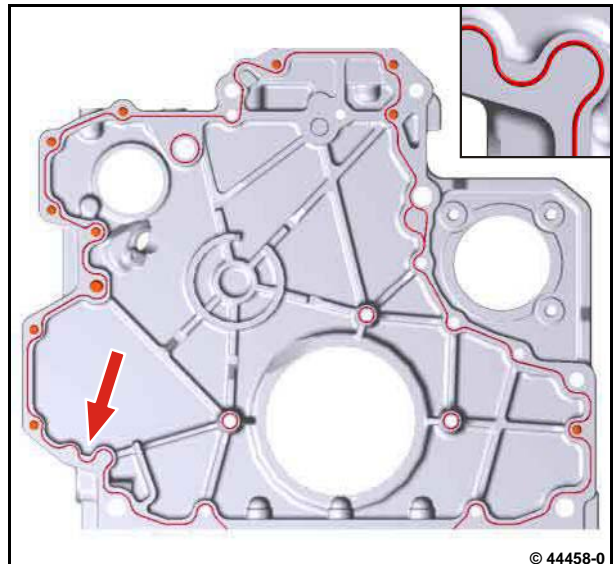


### Attention!

The assembly must be completed within 1 hour at most.



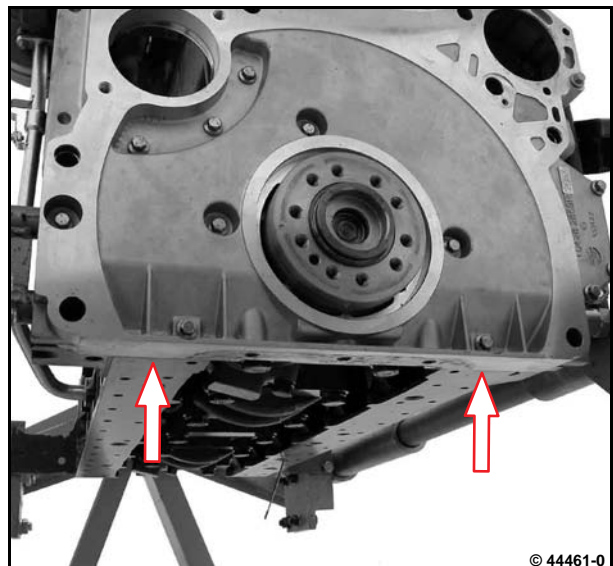
Use packing compound DEUTZ DW 67.  
Sealing bead thickness approx. 1.4 mm.



- Press up gearcase cover and align flush with the oil tray sealing surface (arrows).



The oil tray sealing surface on the crankcase must face downwards.



- Tighten the screws according to the tightening sequence.



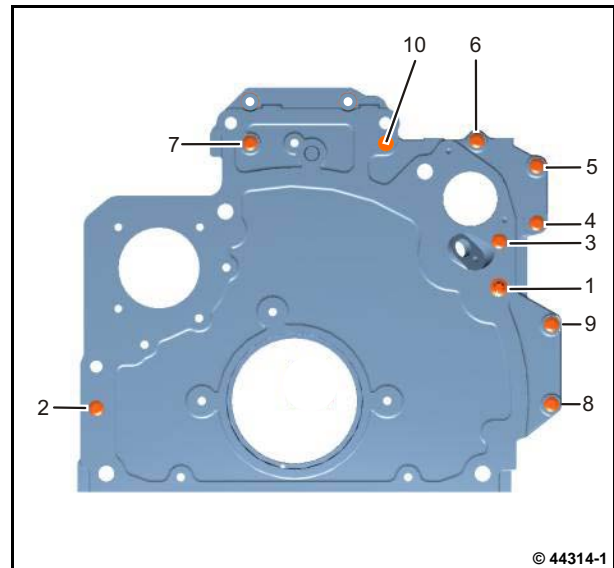
Note different tightening values.

- Tighten screws (1) to (10).



M8 = A03 092

M12 = A03 091



- Install new crankshaft sealing ring (flywheel side).



W 02-02-02

- Insert clamping bushing (1).
- Install connection housing.



W 03-09-04

- Install starter.



W 13-03-02

- Install impulse transmitter (camshaft).

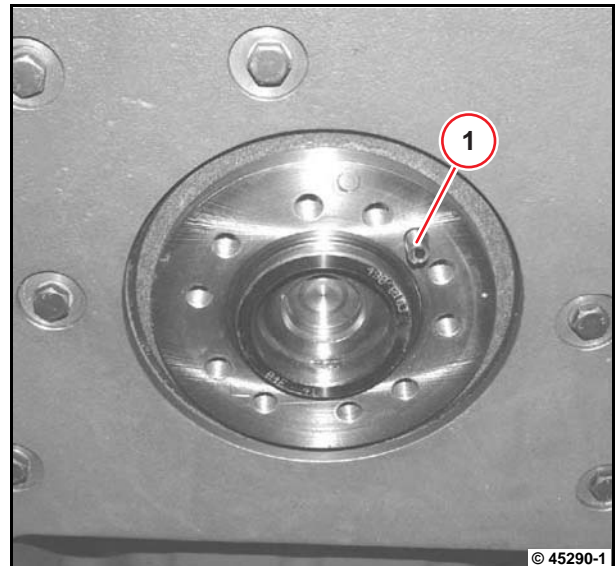


W 05-07-03

- Install lubricating oil pan.



W 08-04-07



- Mount fuel supply pump.



W 07-11-01

- Tighten lock nuts (1).

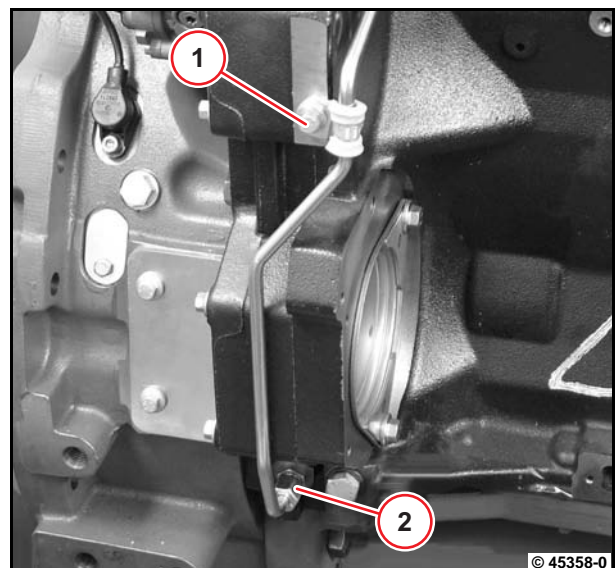


A03 062

- Tighten pipe clip (1).



A03 064





## Removing and installing the camshaft



Commercial available tools:

– Engine lifting device . . . . . 6068



– W 02-04-01

– W 07-15-04

– W 07-15-05

### Removing the camshaft

- Remove high pressure pump and roller tappet (installation position A).

 W 07-15-04

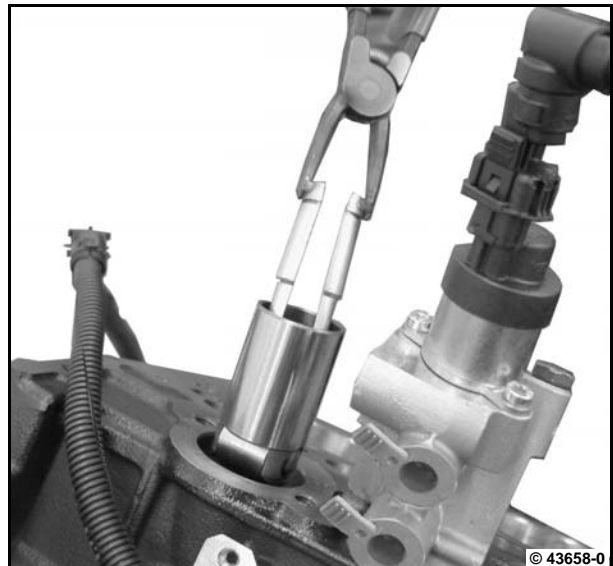
- Remove high pressure pump and roller tappet (installation position B).

 W 07-15-05

- Remove crankshaft.

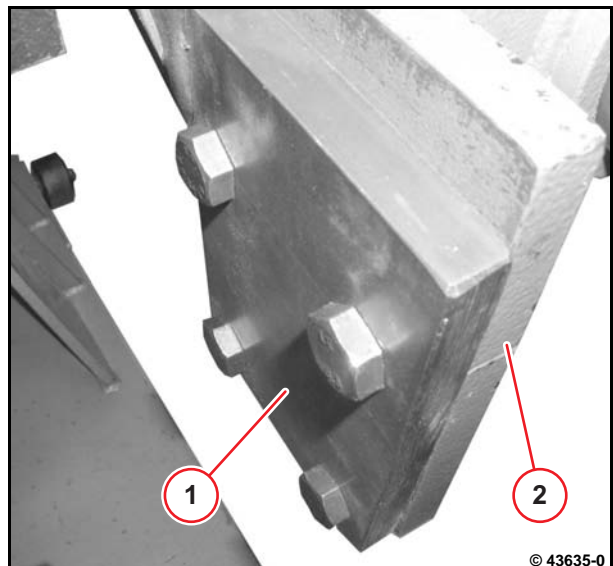
 W 02-04-01

- Hook crankcase to engine lifting device.



- Lift the crankcase slightly with the engine lifting device and keep under tension.

- Remove the clamping bracket (1) from the adapter plates (2) on the flywheel side.

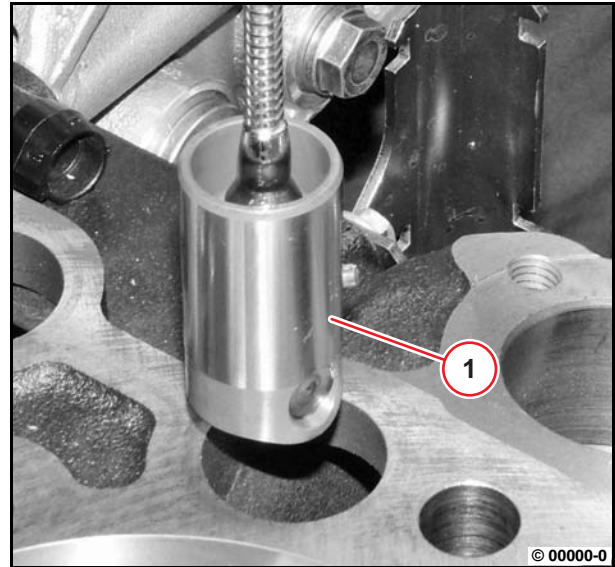


- Move the flywheel side assembly block in the direction of the arrow.
- Remove all roller tappets (1) with magnetic rod.

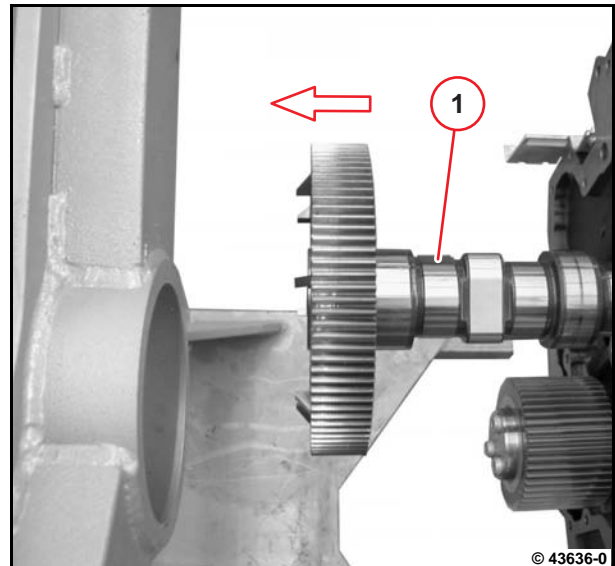


Lay out components in the order in which they should be installed.

Note order of cylinders.

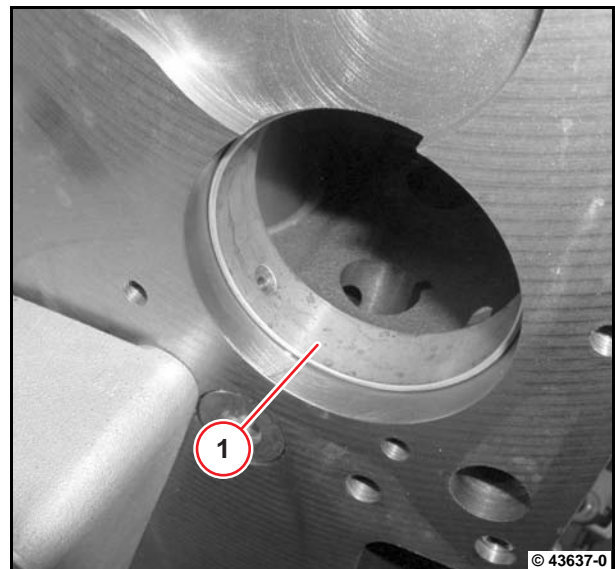


- Pull out the camshaft (1) carefully in the direction of the arrow.
- Visually inspect the components.

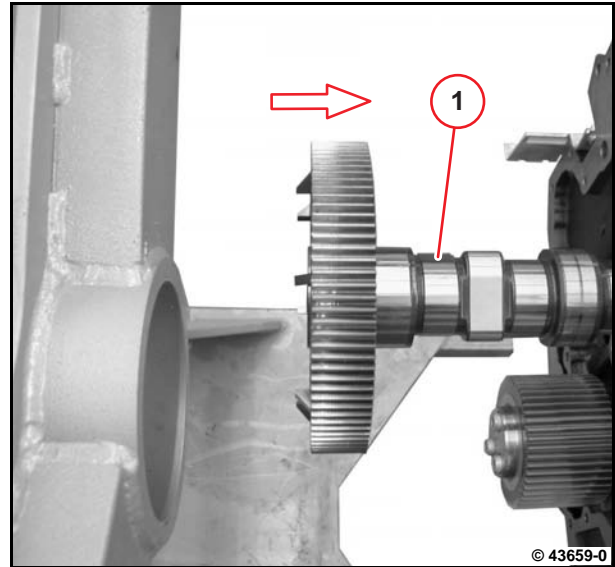


### **Installing the camshaft**

- Oil cam shaft pin lightly.
- Oil camshaft bearing lightly.



- Insert the camshaft (1) carefully in the direction of the arrow.
- Push on the flywheel side assembly block in the direction of the arrow and align.

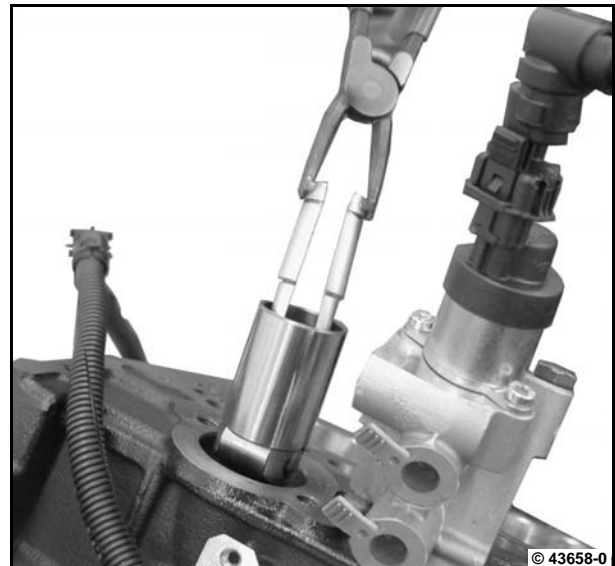


6

- Insert all roller tappets (1).



Note assignment!



- Mount the clamping bracket (1) on the adapter plate (2).



A00 002

- Unhook crankcase from engine lifting device.
- Install crankshaft.



W 02-04-01

- Install high pressure pump and roller tappet (installation position A).

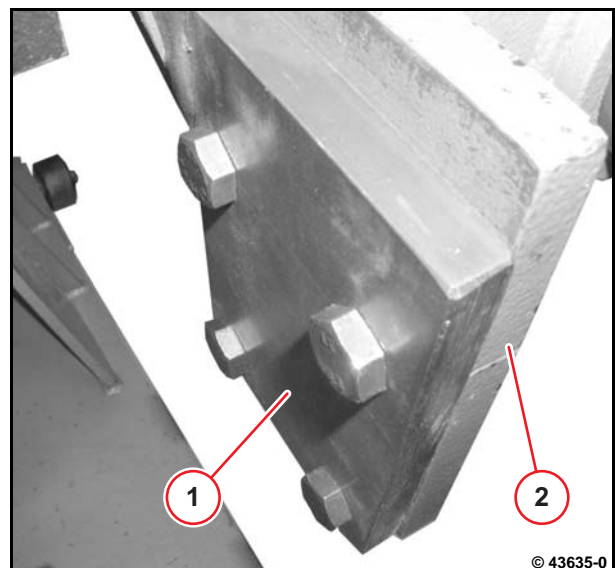


W 07-15-04

- Install high pressure pump and roller tappet (installation position B).



W 07-15-05





## Checking the camshaft



Commercial available tools:  
– Micrometer gauge



– W 04-05-05

6

## Checking the camshaft

- Remove camshaft.



W 04-05-05

- Visually inspect cams and bearing pins for wear.



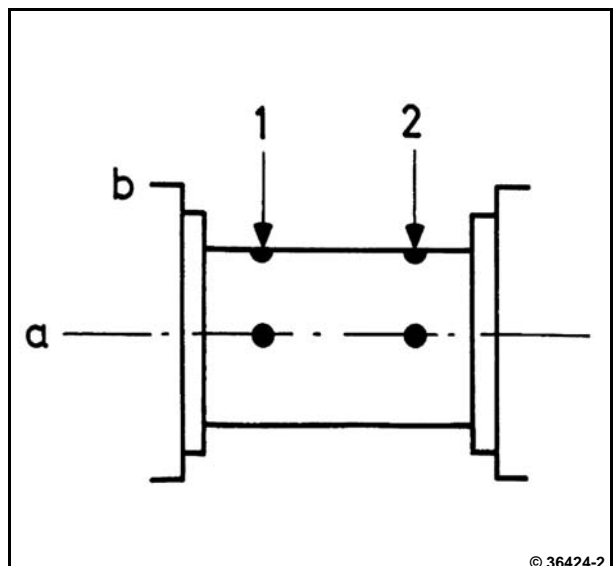
Repairing the camshaft is not permissible.  
The camshaft must be renewed.



© 43558-0



Diagram for measuring the journals at the points 1 and 2 in the levels a and b.



© 36424-2

- Measure the diameter of journals with the micrometer gauge.



P04 31



Measuring points see diagram.

When the wear limit is reached, the camshaft must be renewed.



- Check camshaft gear wheel for visible signs of wear.
- Install the camshaft.



W 04-05-05





## Removing and installing the impulse transmitter (crankshaft)

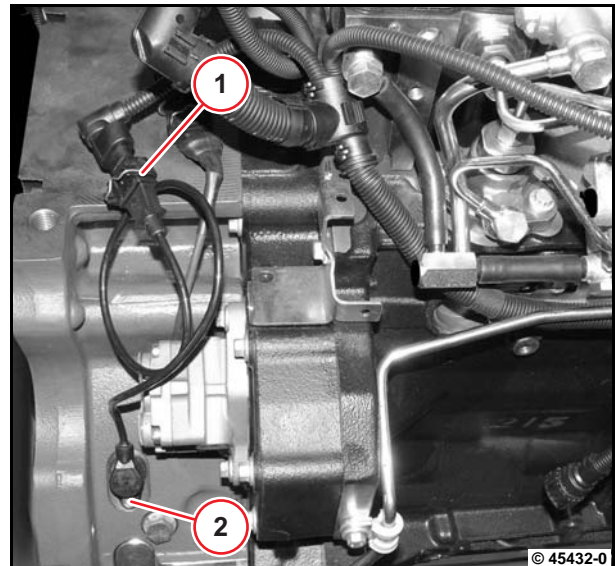


Commercial available tools

6

### Removing the impulse transmitter

- Unlock cable plug (1) and disconnect.
- Unscrew screw (2).
- Remove impulse transmitter.
- Clean sealing surfaces.
- Visually inspect the component.



### Installing the impulse transmitter

- Insert impulse transmitter.
- Tighten screw (2).

 A05 011



#### Attention!

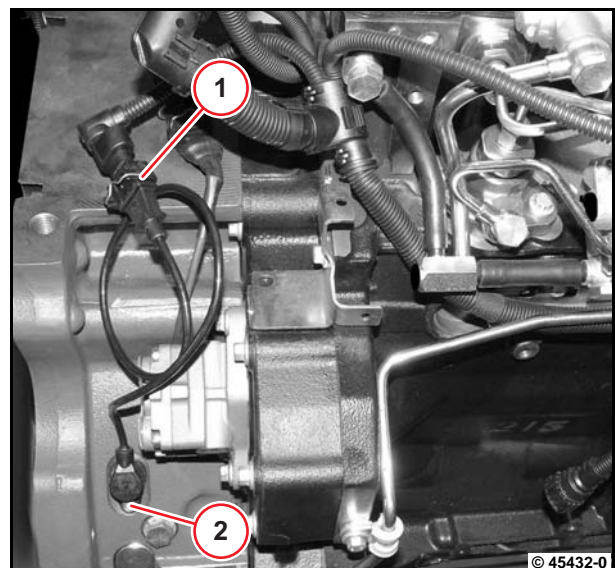
Use new screw.

- Plug cable plugs (1) together.



Ensure that the connection is perfect.

Lay the cable strand without tension and chafing.







## Removing and installing the impulse transmitter (camshaft)

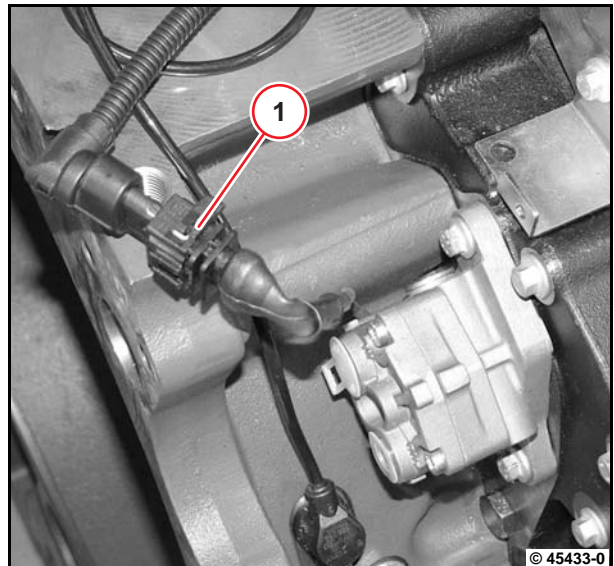


Commercial available tools

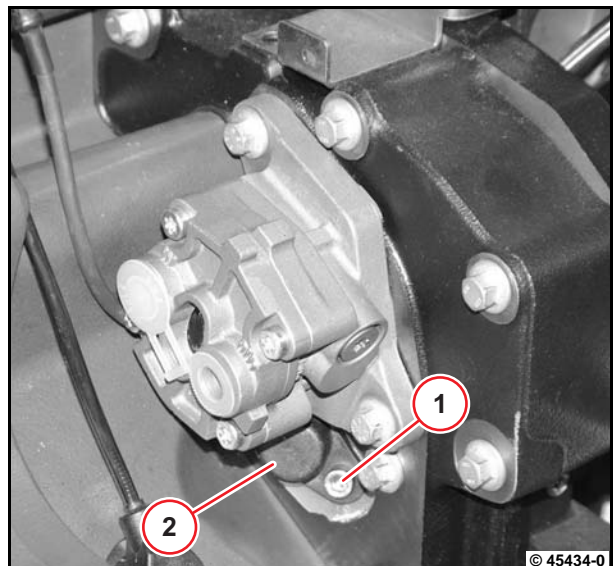
**6**

### Removing the speed governor

- Unlock cable plug (1) and disconnect.

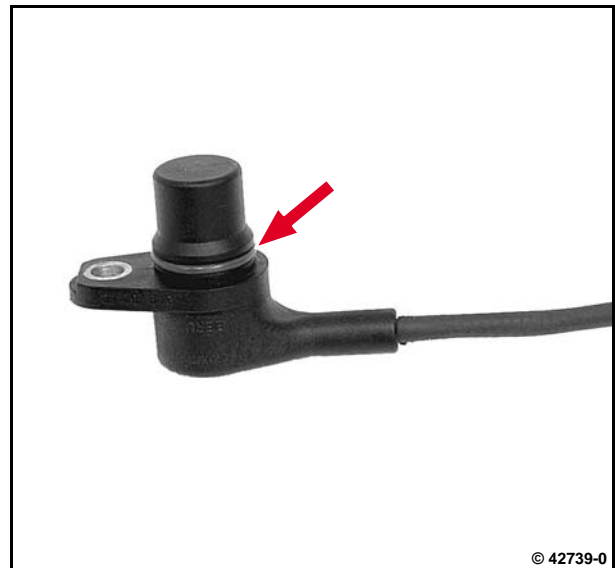


- Unscrew screw (1).
- Remove impulse transmitter (2).
- Clean sealing surfaces.
- Visually inspect the component.



## Installing the speed governor

- Insert new O-ring (arrow).
- Lightly oil O-ring.



- Insert impulse transmitter (2).
- Tighten screw (1).

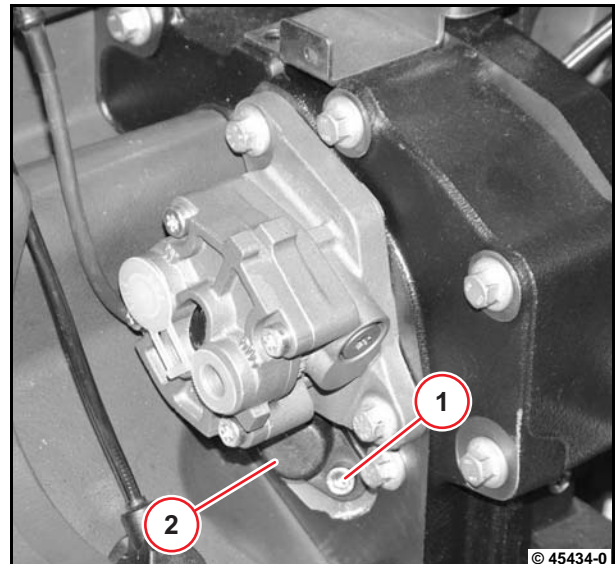


A05 012



### Attention!

Use new screw.

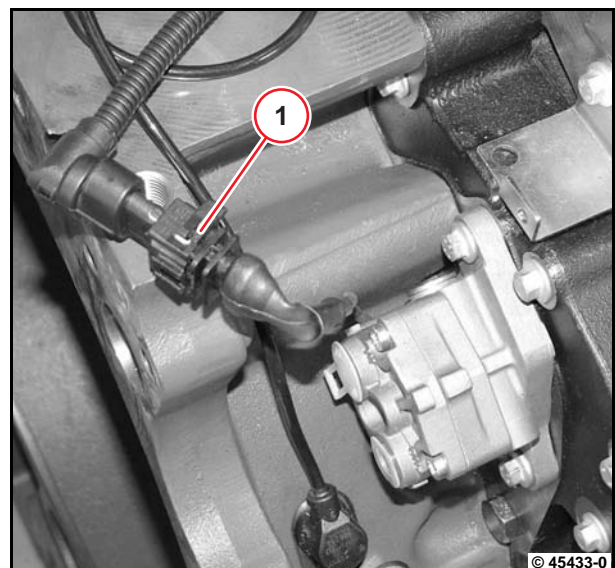


- Plug cable plugs (1) together.



Ensure that the connection is perfect.

Lay the cable strand without tension and chafing.



## Removing and installing the exhaust line



Commercial available tools



– W 06-06-04

6

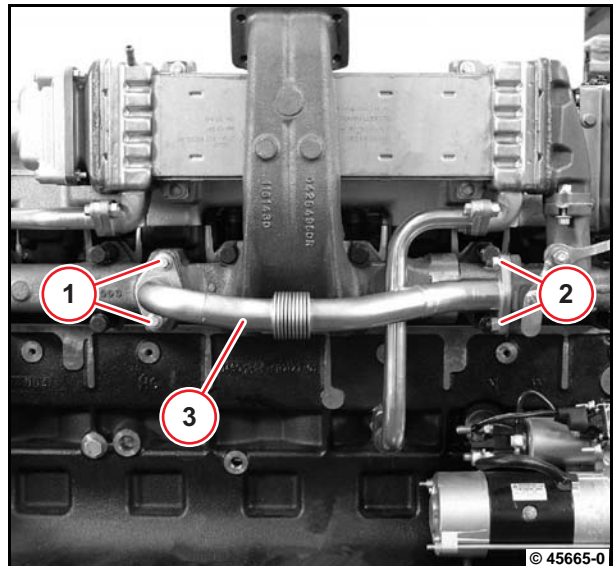
### Removing exhaust line

- Remove turbocharger.

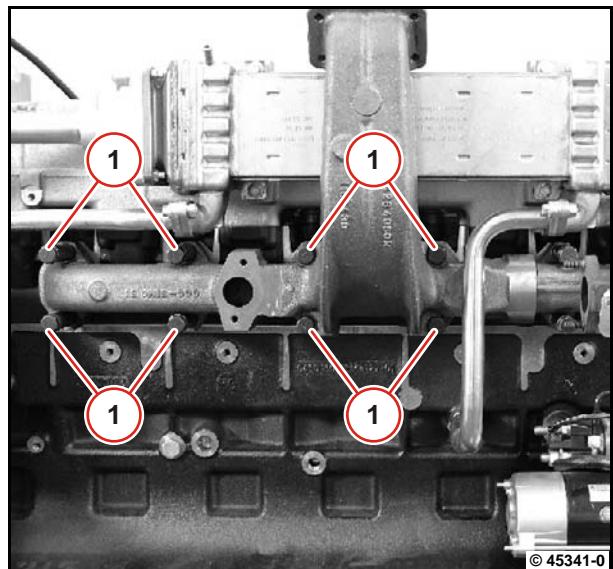


W 06-06-04

- Unscrew screws (1).
- Unscrew the nuts (2).
- Remove pipe (3).
- Remove seals.

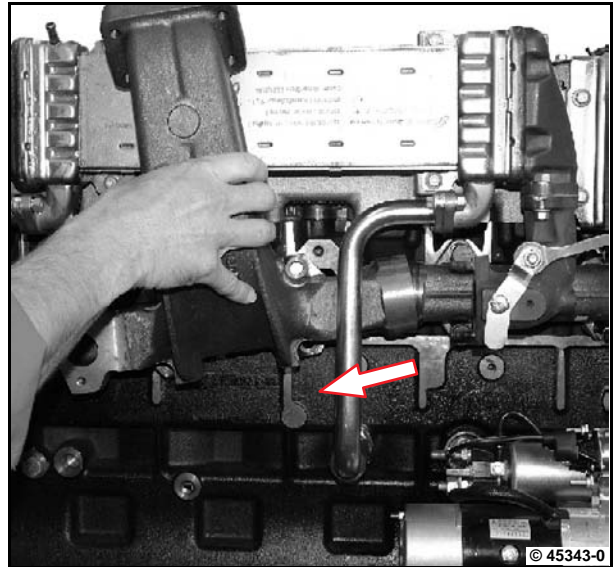


- Unscrew screws (1).

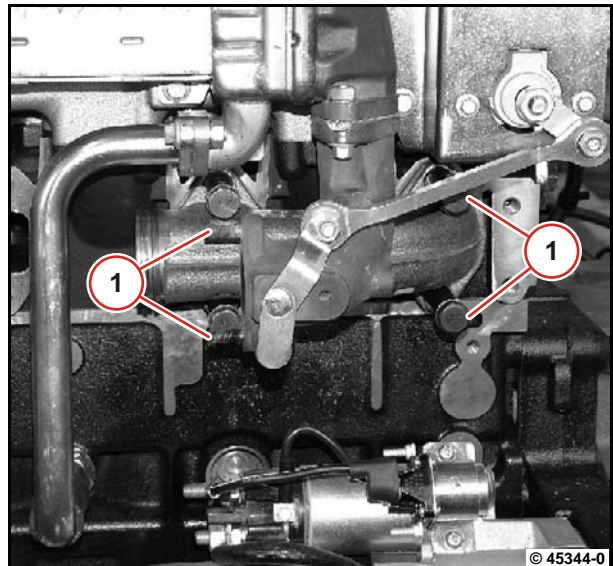


- Pull out exhaust pipe from the side.
- Remove seals.

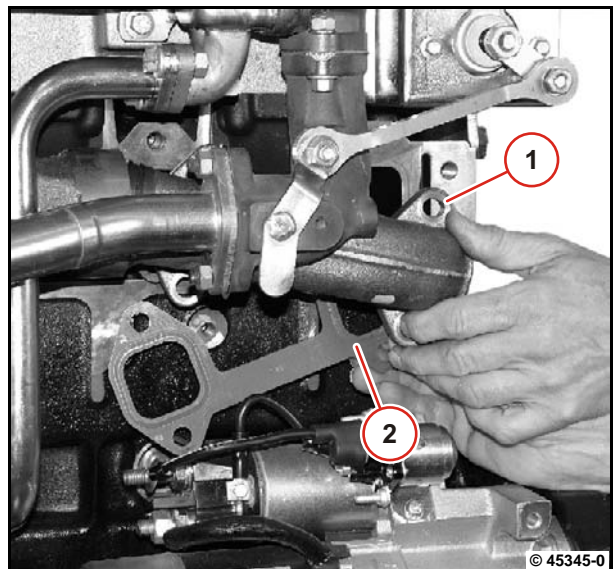
6



- Unscrew screws (1).

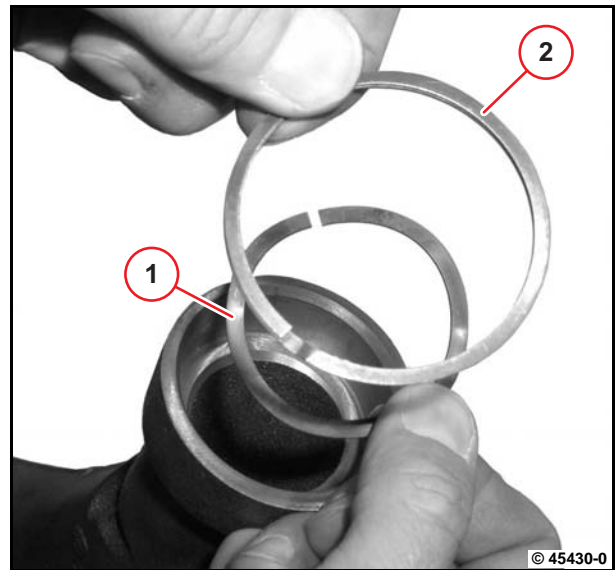


- Remove exhaust pipe (part).
- Remove gasket (2).



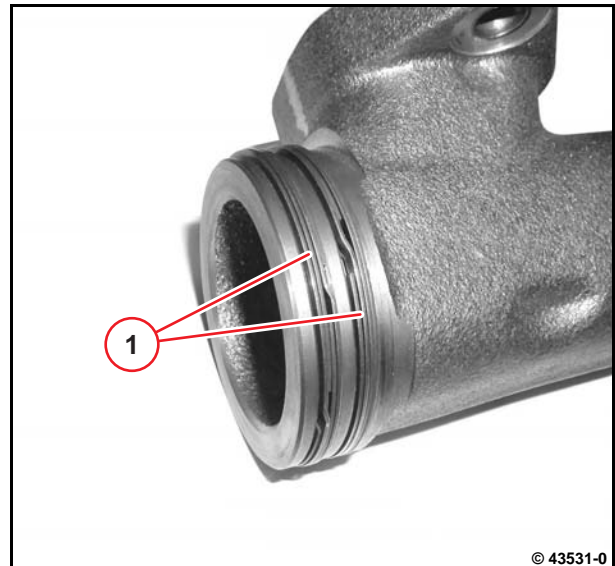


- Remove ondular washer (1).
- Remove laminar ring (2).



6

- Remove laminar ring set (1).

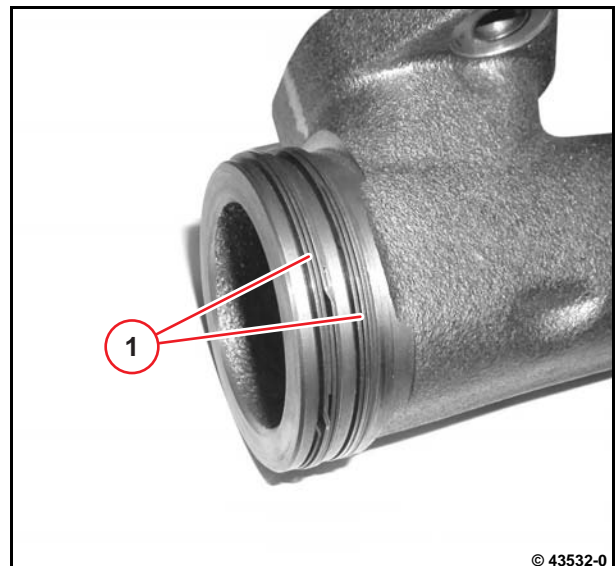


### Installing exhaust line

- Insert the new laminar ring set (1) into the groove.



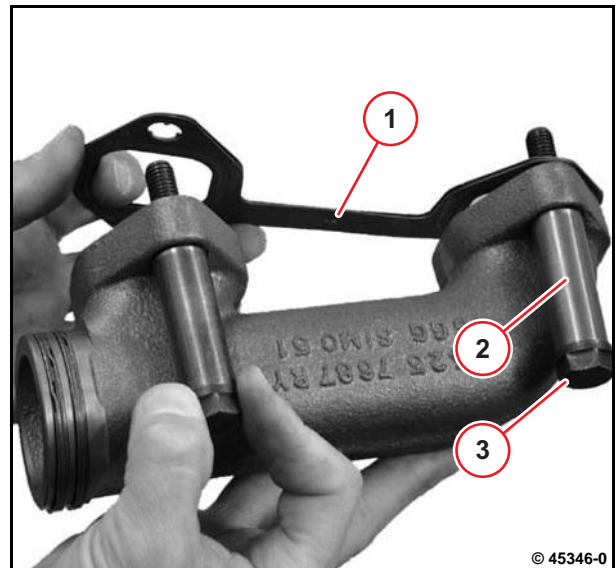
Install the laminar rings with the 180° joint.



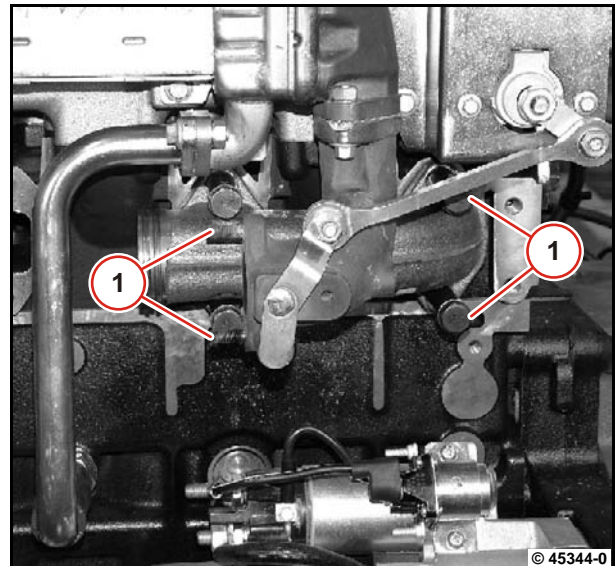
- Clean sealing surfaces.
- Mount gasket (1).
- Mount spacer sleeves (2).
- Turn in the new screws a few turns into the gasket.
- Turn in screws (3) a few turns.



The gasket is stopped by the screw thread.



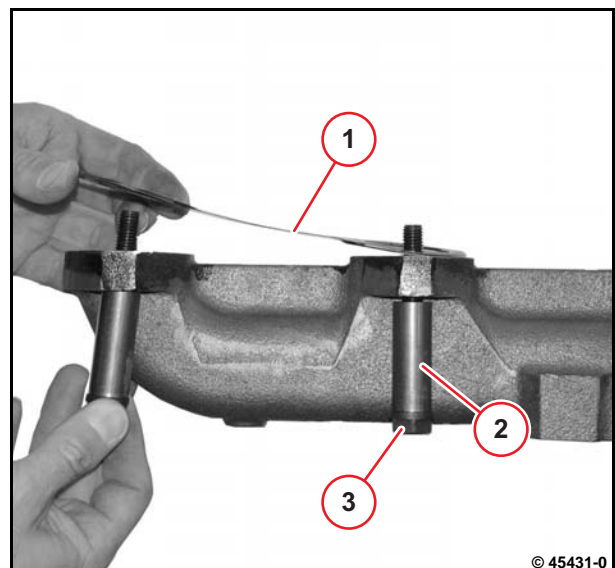
- Mount exhaust pipe (piece).
- Tighten screws (1).



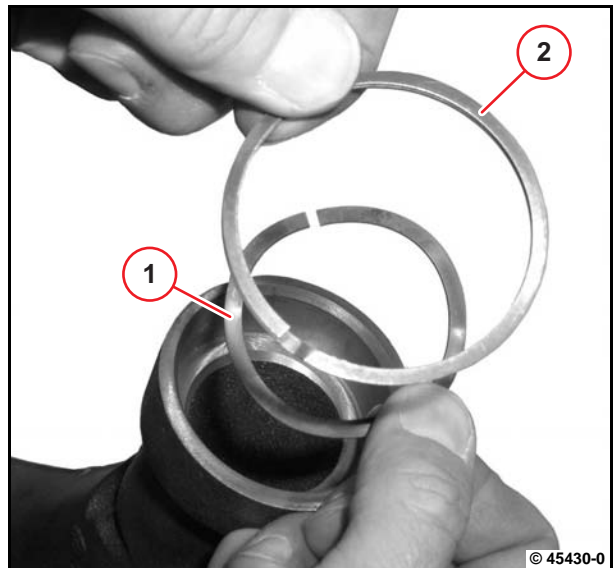
- Clean sealing surfaces.
- Mount gasket (1).
- Mount spacer sleeves (2).
- Turn in the new screws a few turns into the gasket.
- Turn in screws (3) a few turns.



The gasket is stopped by the screw thread.

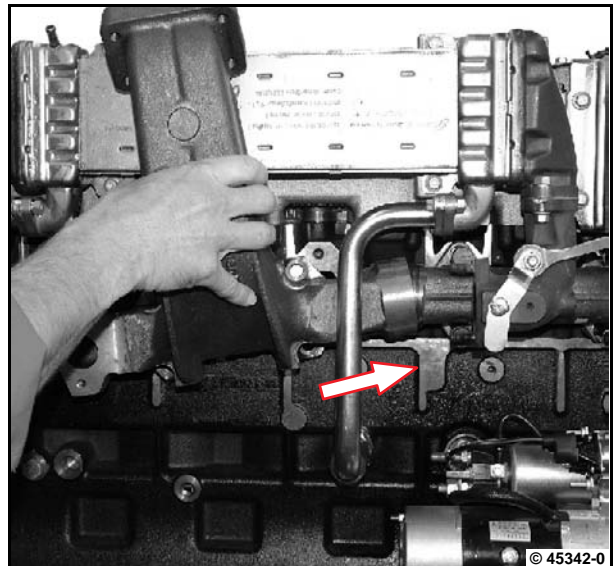


- Insert new ondular washer (1).
- Insert new laminar ring (2).

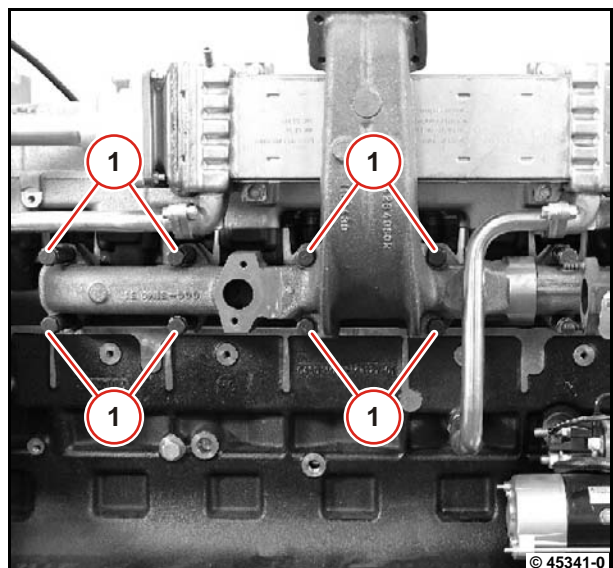


6

- Push on exhaust pipe.

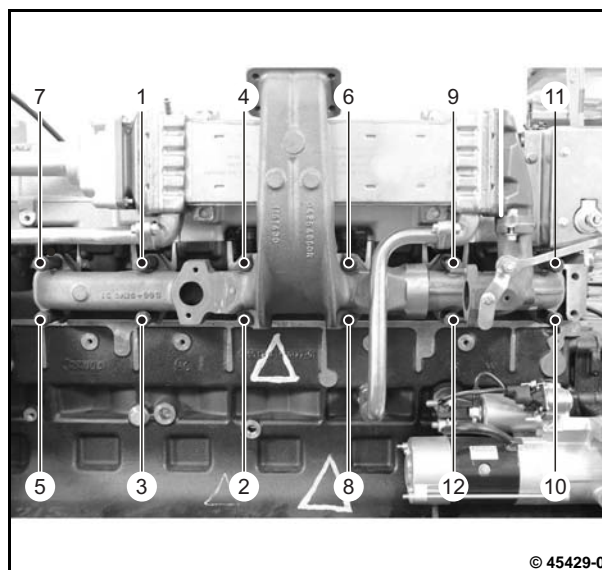


- Tighten screws (1).

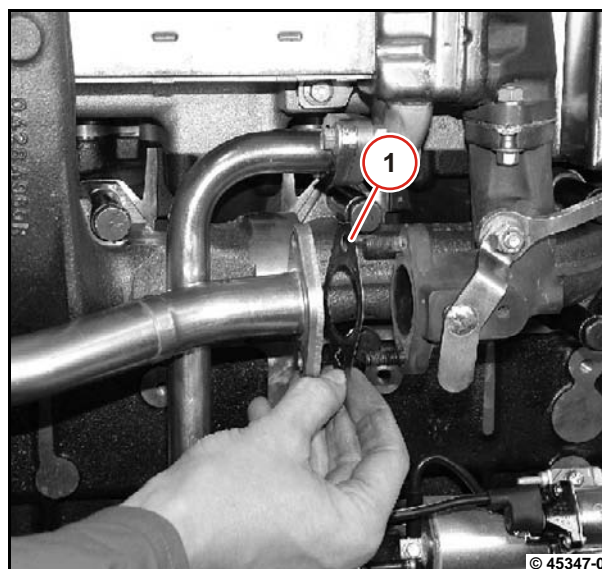


- Tighten the screws according to the tightening sequence.

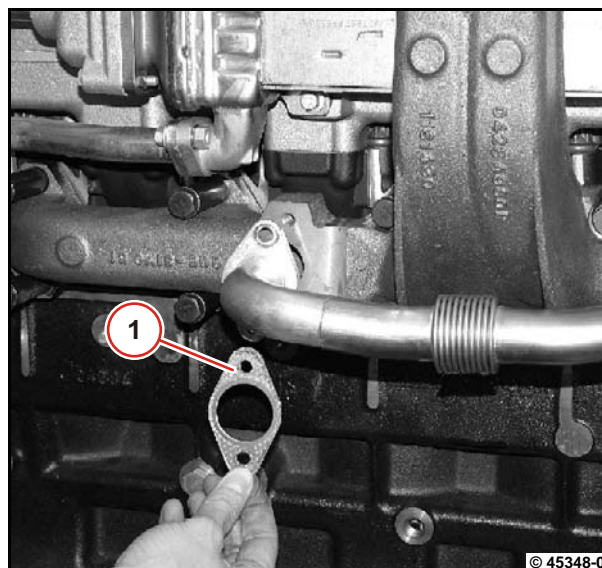
 A06 001



- Insert new seal (1).
- Screw on nuts.



- Insert new seal (1).
- Fasten screws.

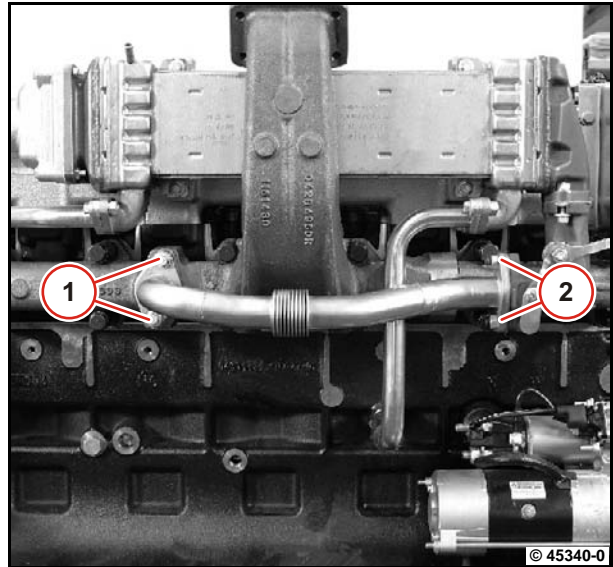




- Tighten screws (1) and nuts (2).

 **A06 063**

- Install the turbocharger.

 **W 06-06-04**



## Remove and install the charge air line





Commercial available tools

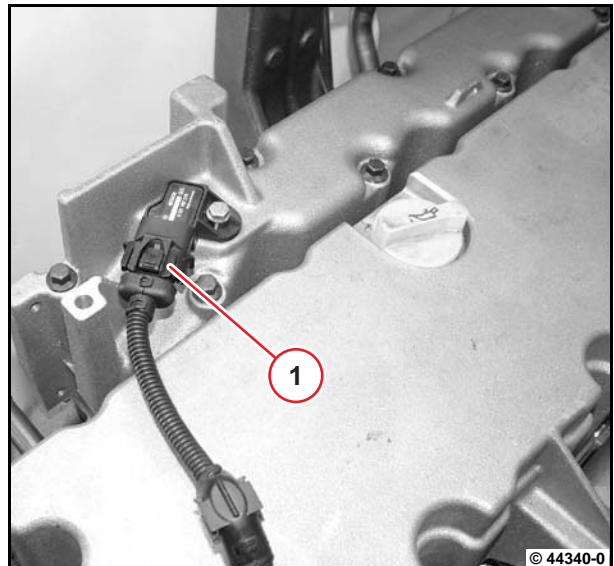


– W 06-09-04  
– W 06-09-05

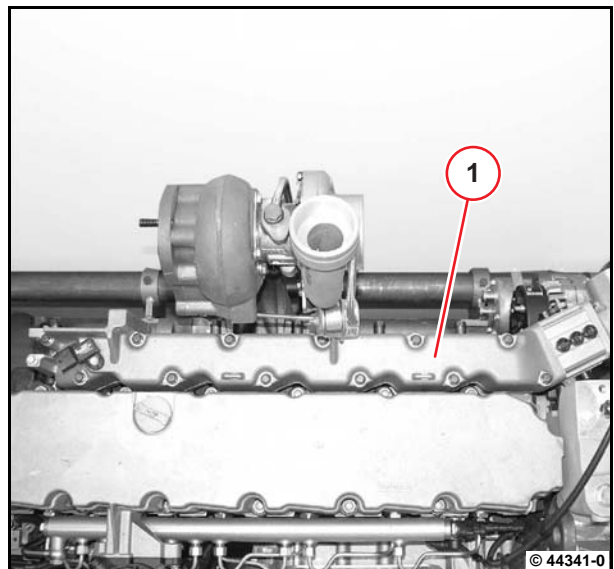
**6**

### Remove charge air line

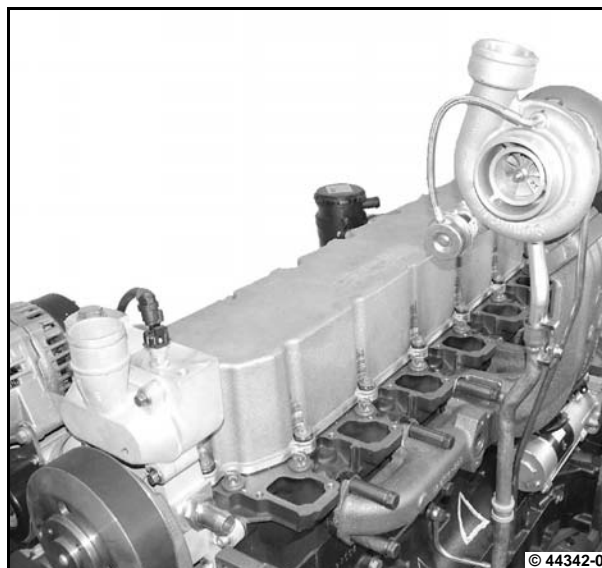
- Remove cooler.  
 W 06-09-04
- Remove actuator.  
 W 06-09-05
- Unlock cable plug (1) and remove.



- Unscrew all screws.
- Remove charge air line (1).
- Remove gasket.



- Clean sealing surfaces on cylinder head side.



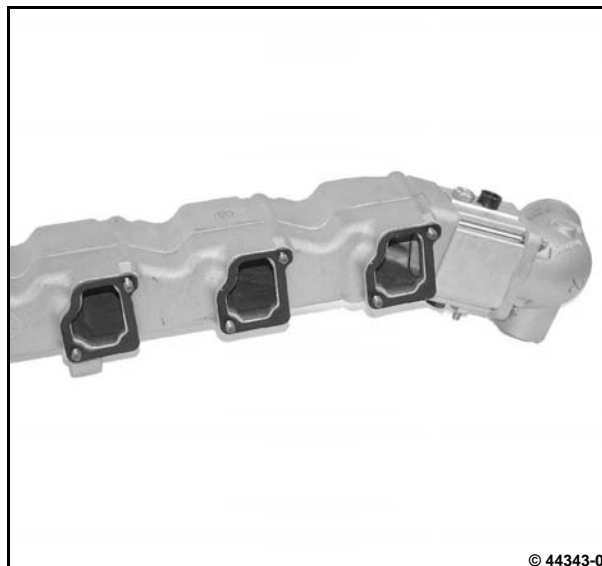
6

### **Install charge air line**

- Clean sealing surfaces of charge air pipe.
- Mount new seals.
- Turn in the screws a few turns into the gaskets.



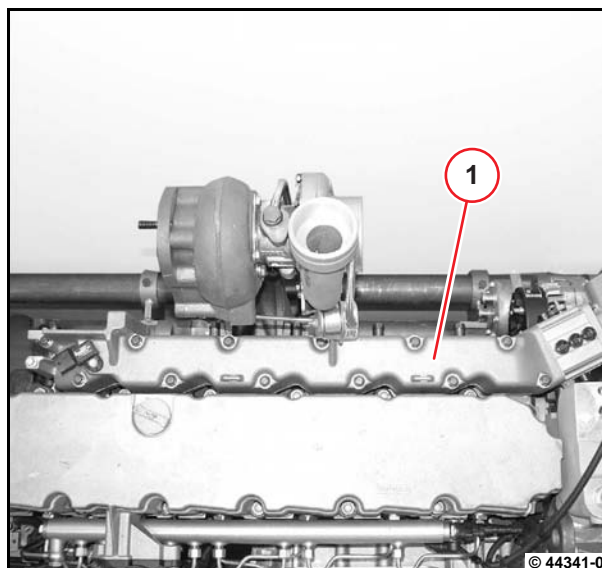
The gaskets are stopped by the screw thread.



- Mount charge air line.
- Fasten screws.



Ensure that the installation location of the gaskets is free from faults.



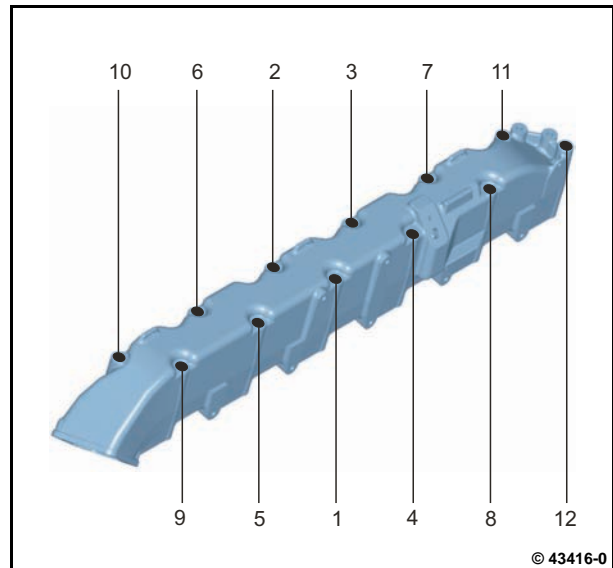


Tightening sequence on the 6-cylinder engine.

- Tighten the screws according to the tightening sequence.



A06 030



6

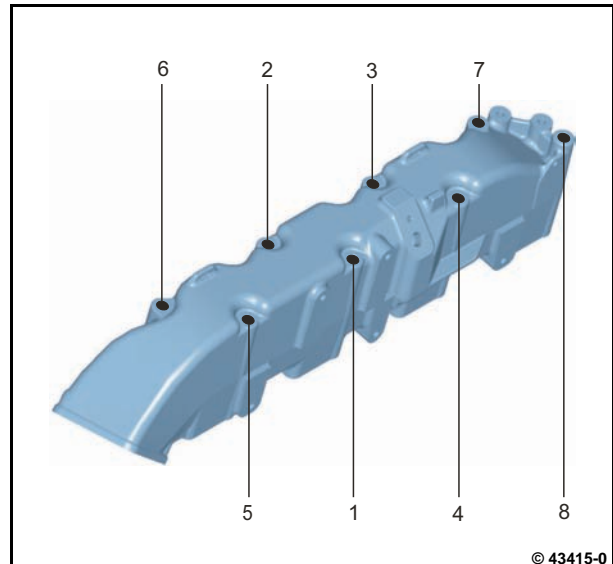


Tightening sequence on the 4-cylinder engine.

- Tighten the screws according to the tightening sequence.



A06 030



- Plug in the cable plug (1) and snap in lock.
- Install actuator.

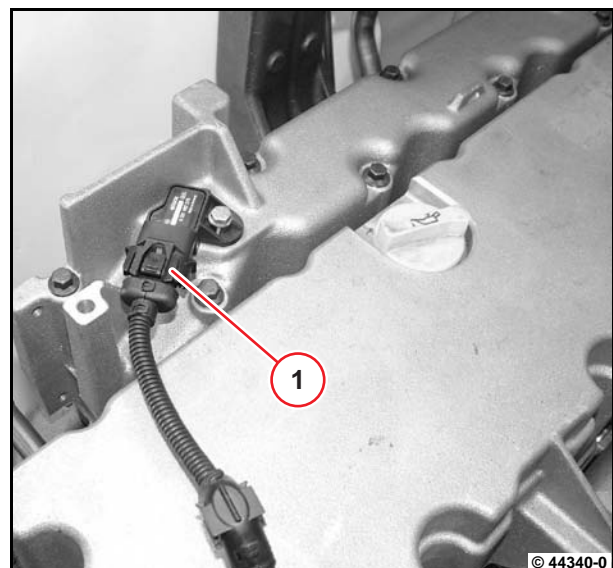


W 06-09-05

- Install cooler.



W 06-09-04





## Remove and install the heating flange



Commercial available tools:  
– Open end wrench adapter . . . . . 8196



– W 06-09-03

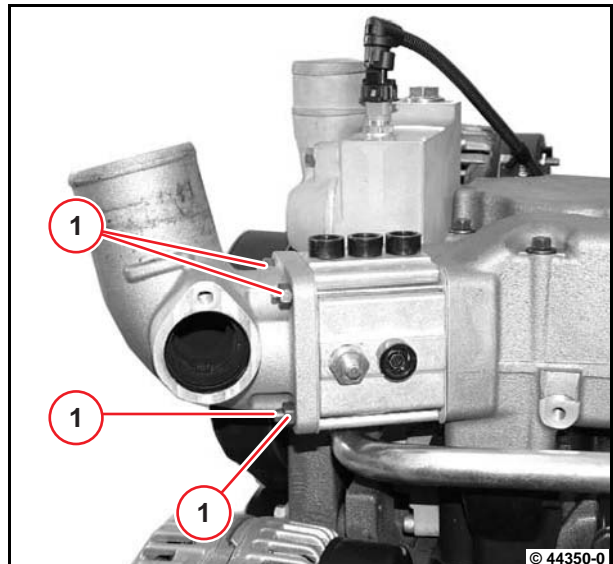
### Removing the heating flange

- Disconnect cables.
- Remove pipe and flutter valve.

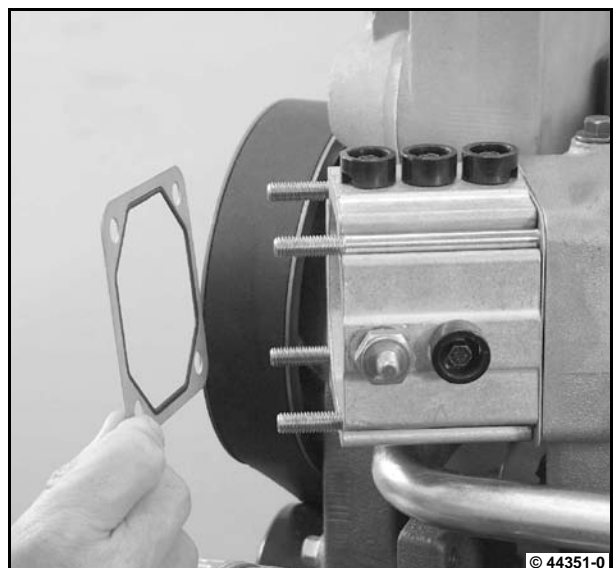


W 06-09-03

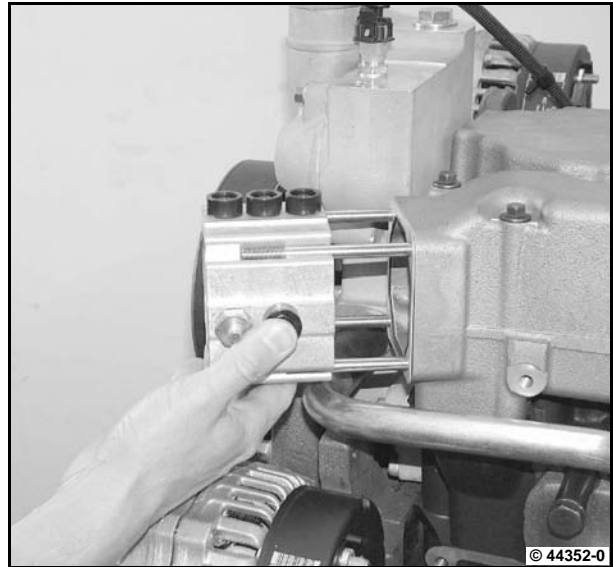
- Unscrew nuts (1).



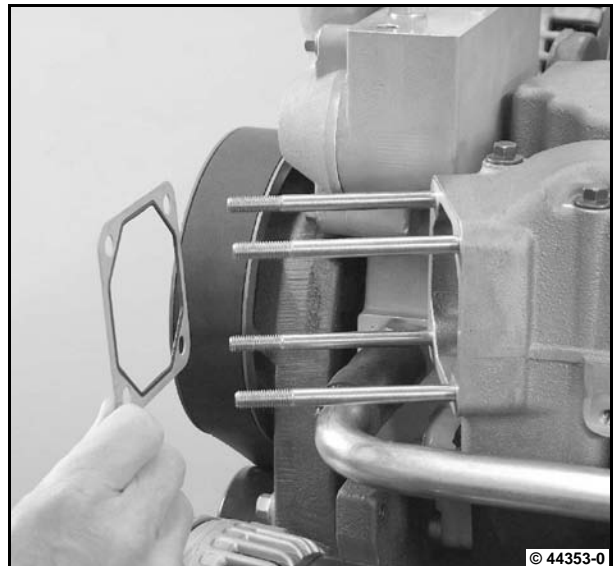
- Remove mixing pipe.
- Remove gasket.



- Pull off heating flange.

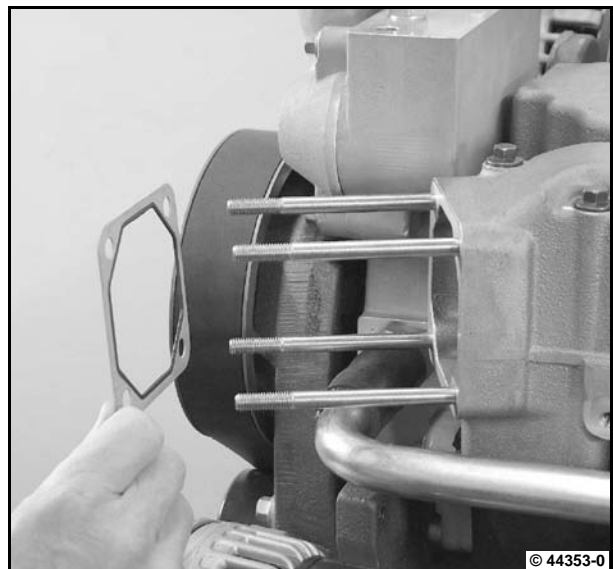


- Remove gasket.



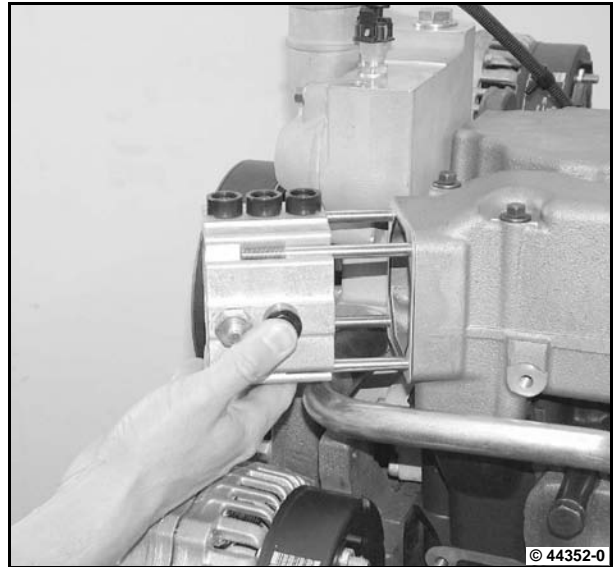
### **Installing the heating flange**

- Push on new gasket.



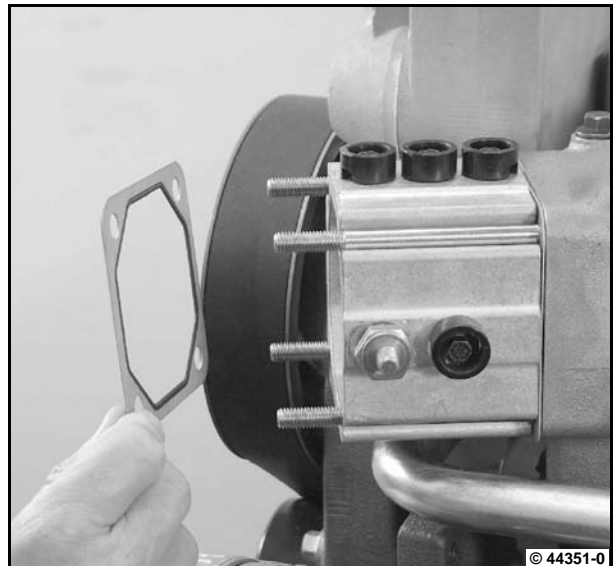


- Push on heating flange.



6

- Mount new gasket.



- Screw on nuts (1).
- Tighten nuts with open end wrench adapter.

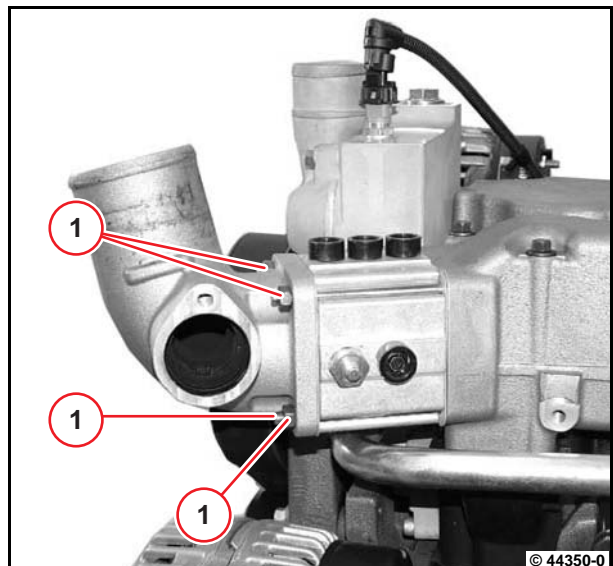
 A06 042

- Install pipe and flutter valve.

 W 06-09-03

- Connect cable.

 A13 065





## Removing and installing the turbocharger



Commercial available tools



– Fitting compound  
DEUTZ AP1908

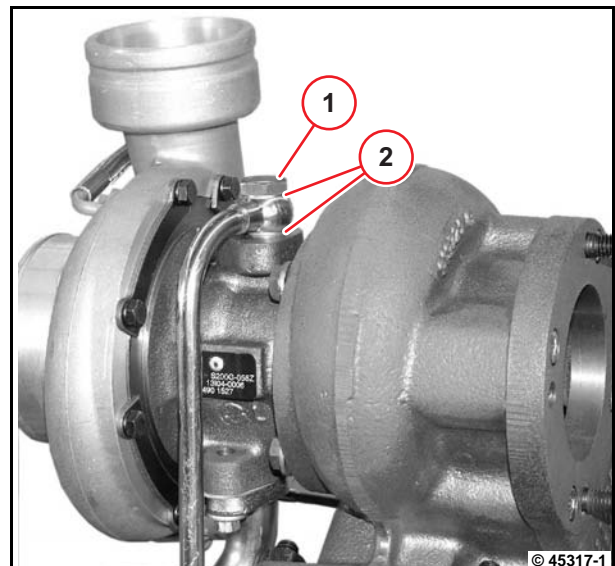


Collect leaking operating substances in suitable vessels and dispose of according to regulations.

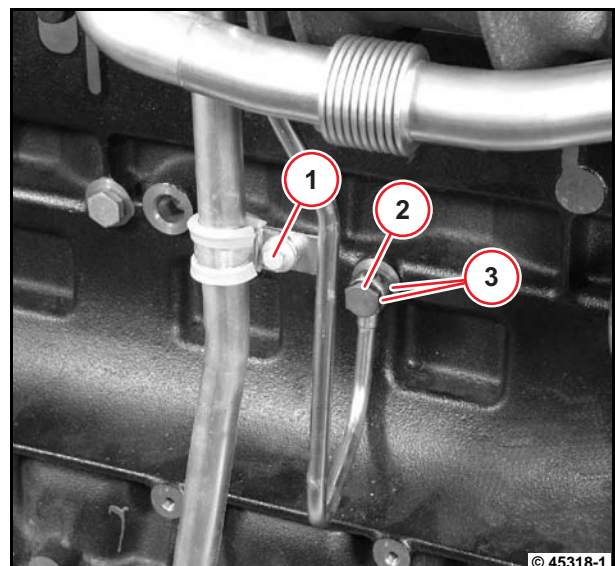
The engine oil should be filled according to the operating manual.

### Removing turbocharger

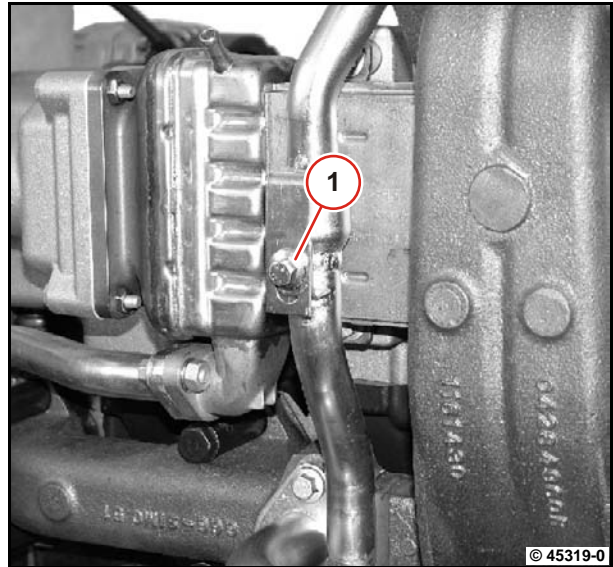
- Unscrew hollow screw (1).
- Remove sealing rings (2).



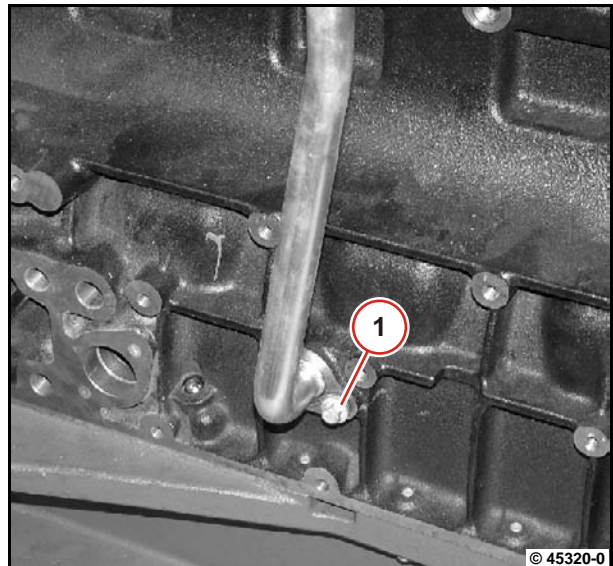
- Unscrew screw (1).
- Unscrew hollow screw (2).
- Remove sealing rings (3).
- Remove lubricating oil pipe.



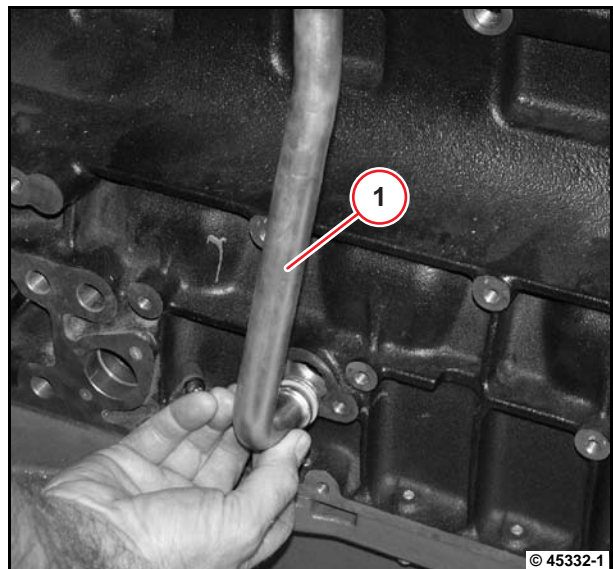
- Unscrew screw (1).



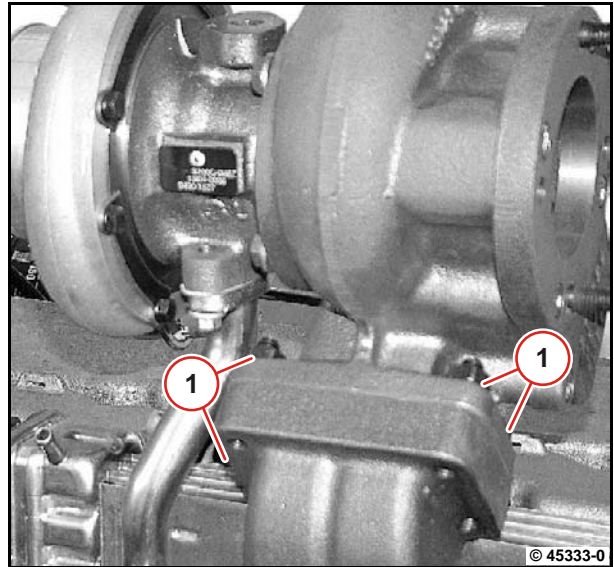
- Unscrew screw (1).
- Remove retainer.



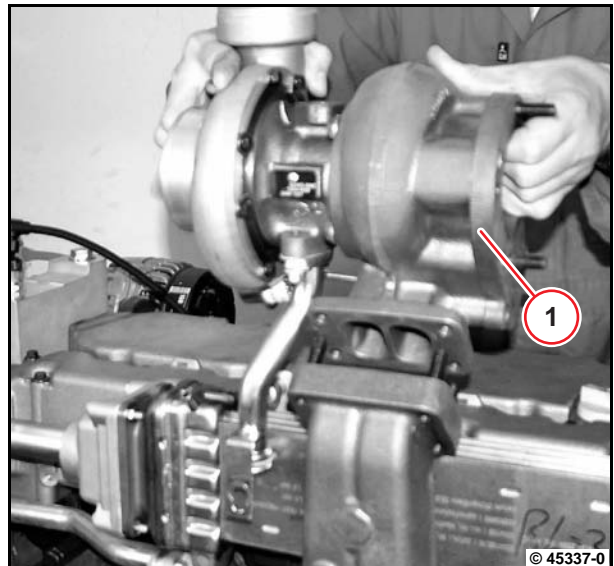
- Pull out oil return pipe (1).
- Remove oil return pipe (1).
- Close openings.



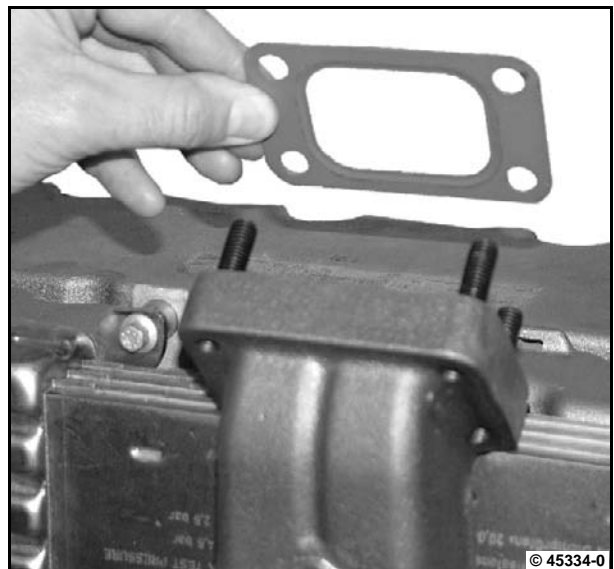
- Unscrew nuts (1).

**6**

- Remove turbocharger (1).



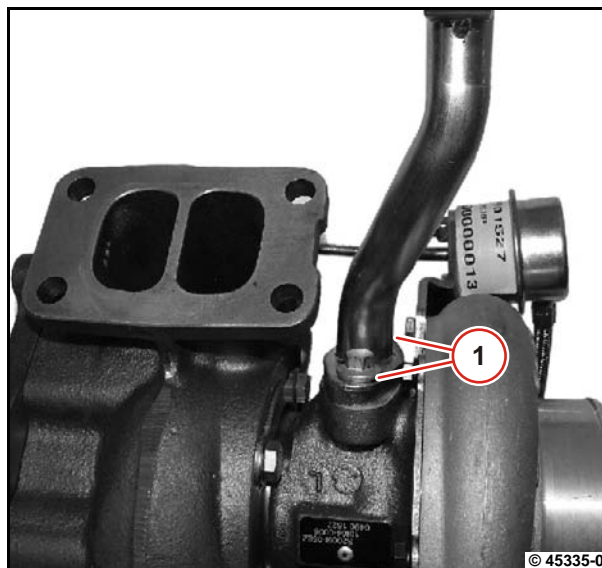
- Remove gasket.





- Unscrew screws (1).
- Remove gasket.

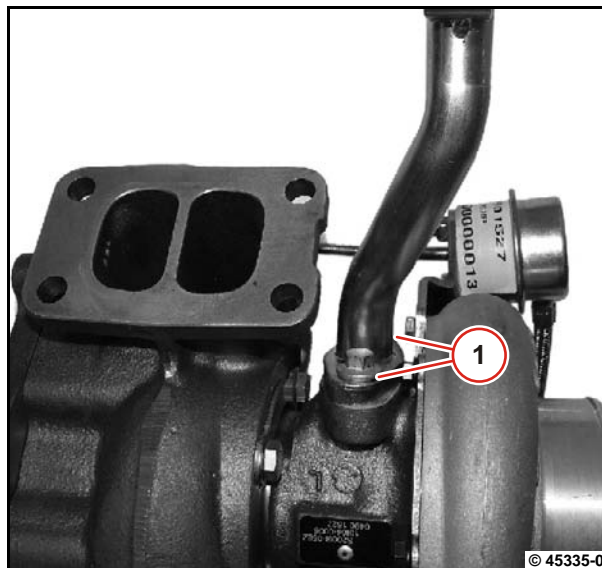
**6**



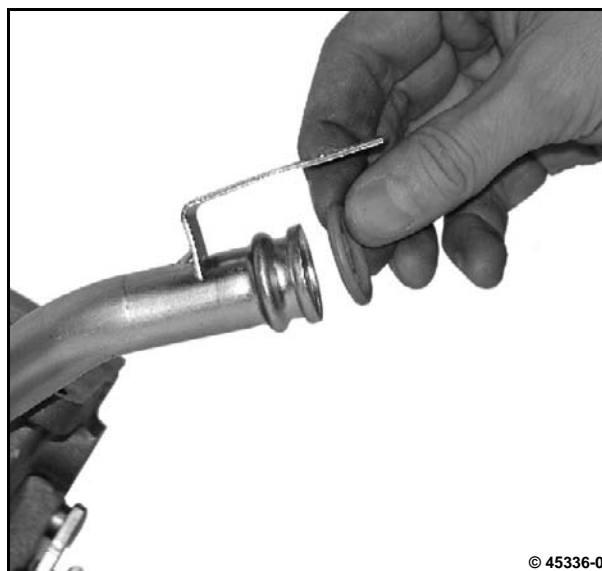
### Installing the turbocharger

- Mount new gasket.
- Mount oil return pipe.
- Tighten screws (1).

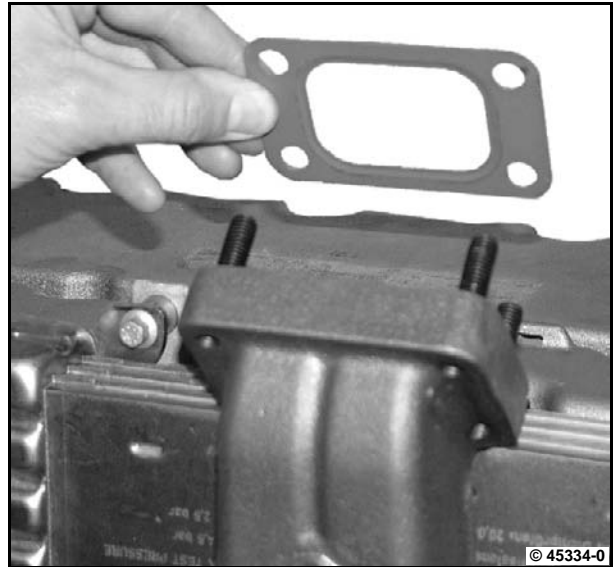
 **A08 044**



- Mount the new O-ring.
- Lightly coat O-ring with fitting compound.



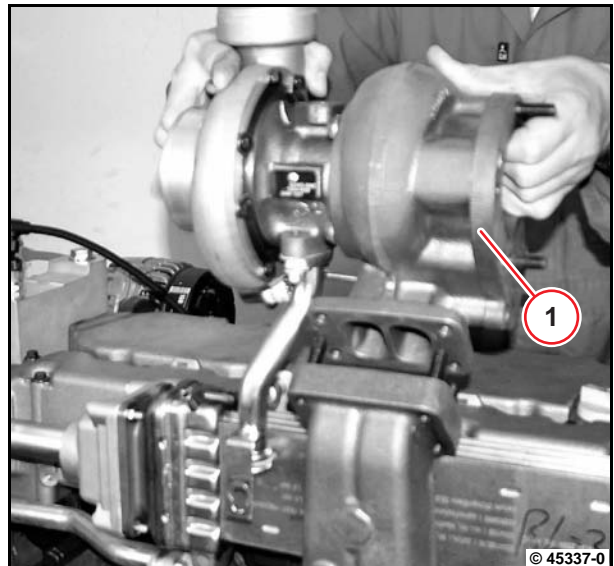
- Mount new gasket.



6

- Mount turbocharger (1).
- Tighten nuts.

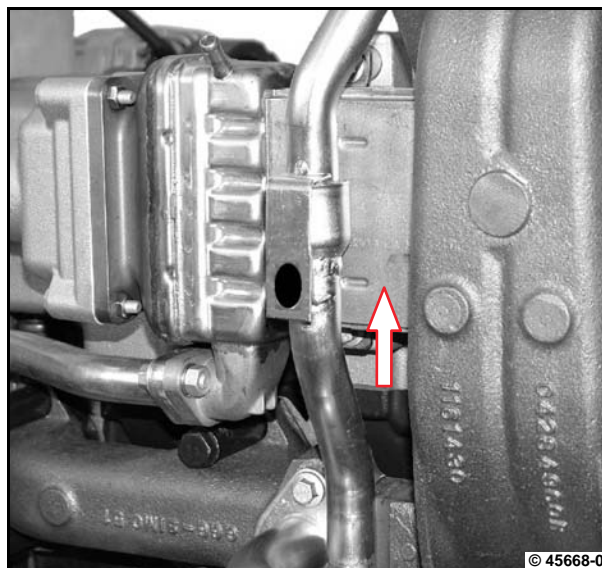
 A06 020



- Mount the new O-ring.
- Lightly coat O-ring with fitting compound.



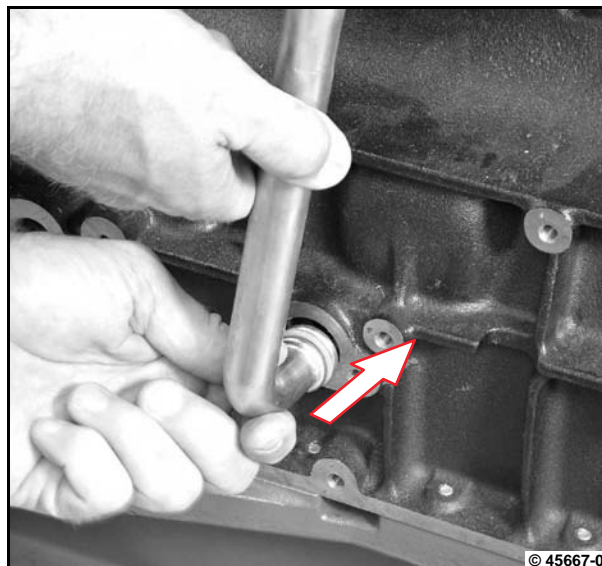
- Push together oil return pipe.



- Push oil return pipe in direction of arrow.



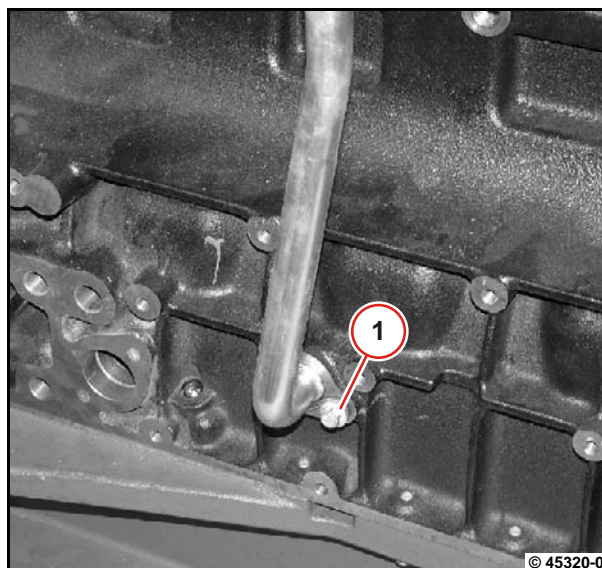
Ensure that the installation location of the sealing ring is free from faults.



- Mount retainer.
- Tighten screw (1).



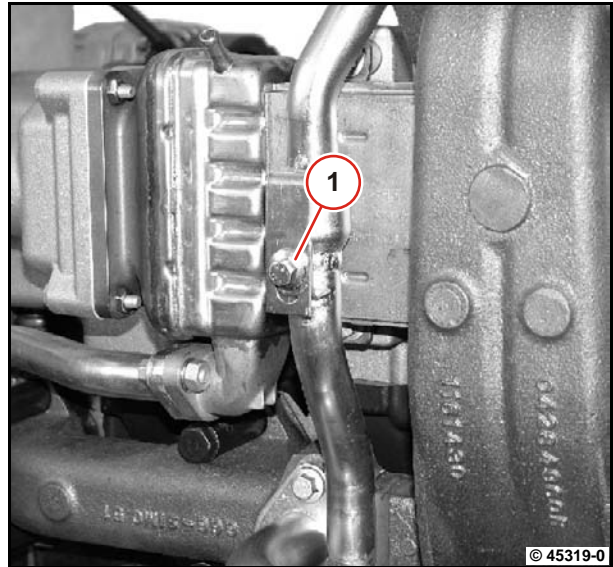
A08 046





- Tighten screw (1).

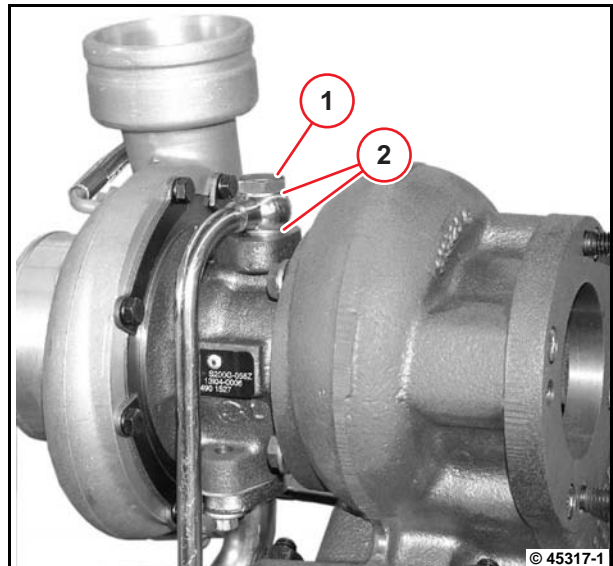
 A12 095



6

- Insert new sealing rings (2).
- Tighten hollow screw (1).

 A08 040

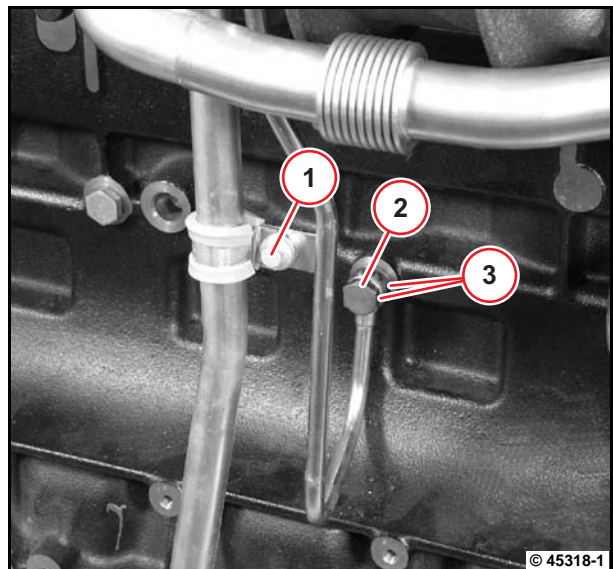


- Insert new sealing rings (3).
- Tighten hollow screw (2).

 A08 040

- Tighten screw (1).

 A12 095





## Removing and installing the flutter valve (exhaust gas recirculation)



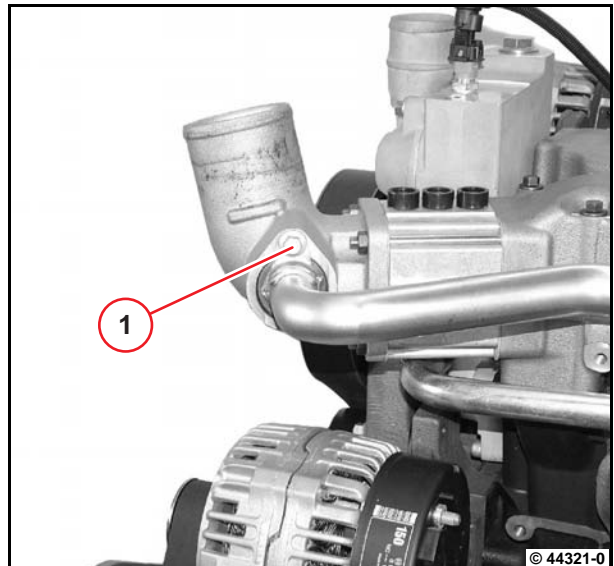
Commercial available tools



– Fitting compound  
DEUTZ AP1908

### Removing the flutter valve

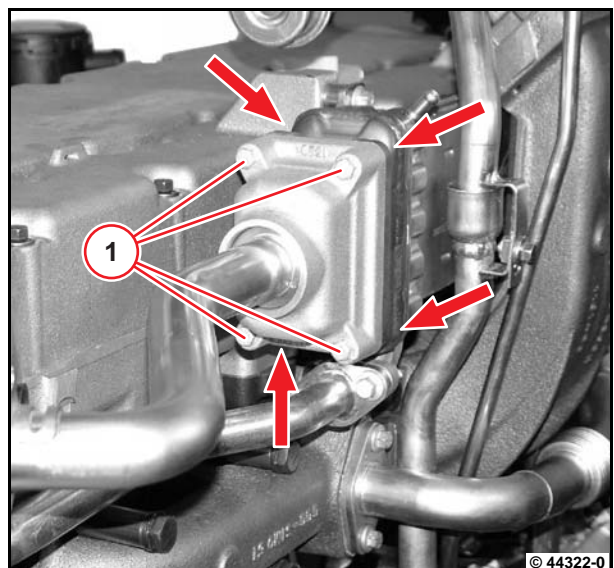
- Unscrew screw (1).



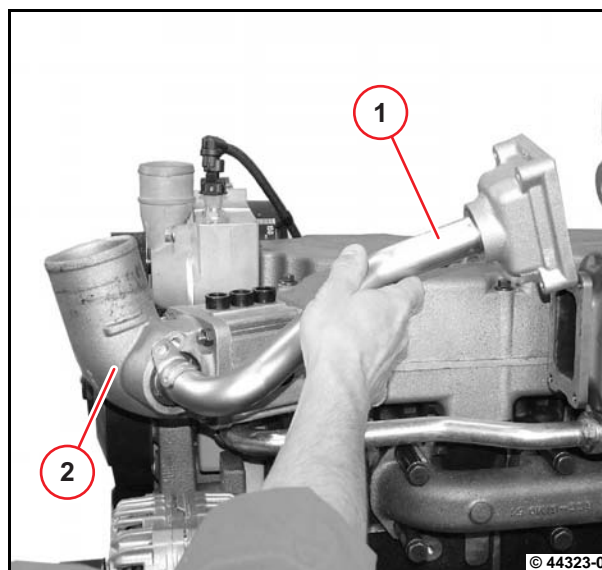
- Unscrew screws (1).



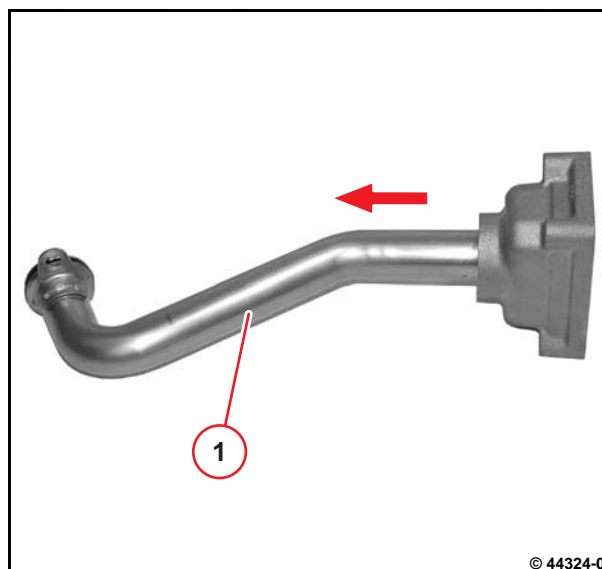
Note nuts (arrows).



- Turn pipe (1) up.
- Pull out pipe.



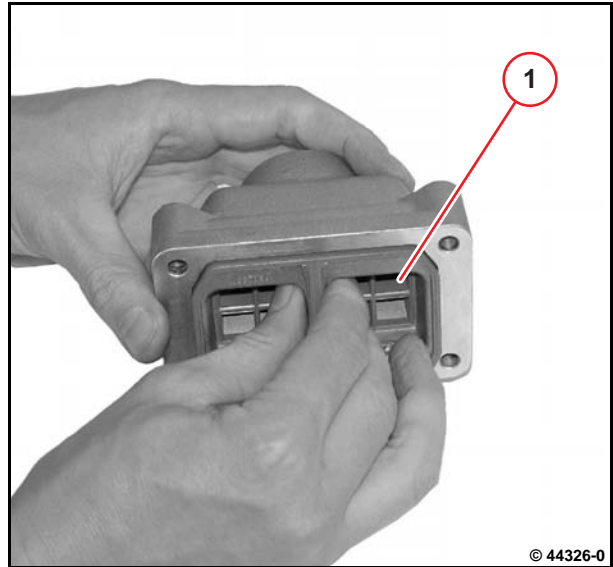
- Pull out the pipe (1) in the direction of the arrow.



- Remove O-rings.



- Remove flutter valve (1).



### Installing the flutter valve

- Insert sealing ring with assembly grease.



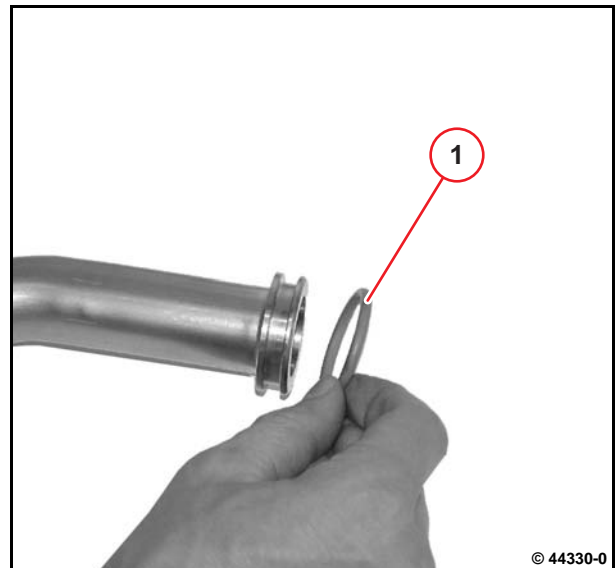
Ensure that the installation location is free from faults.



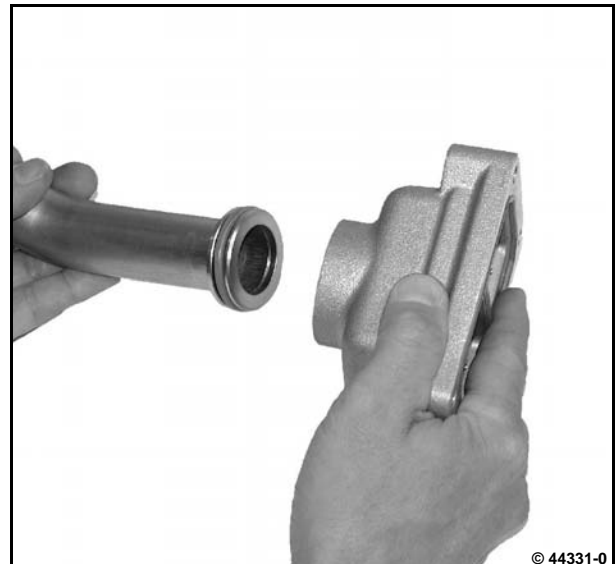
- Insert flutter valve (1).



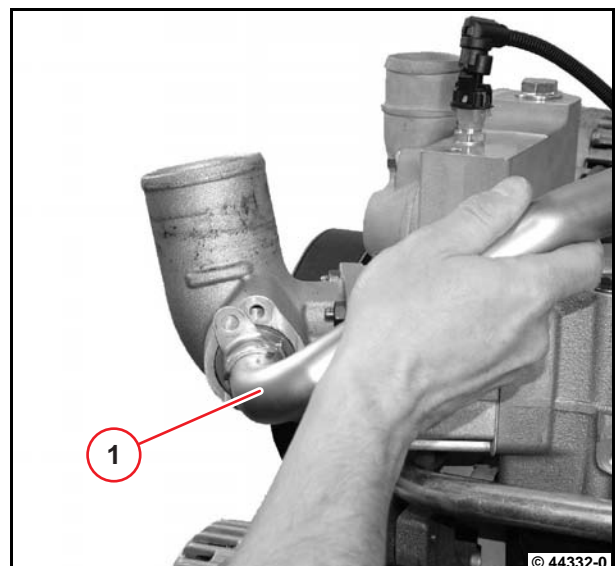
- Insert new O-rings (1).
- Coating with mounting compound.



- Clean sealing surfaces.
- Insert pipe.



- Push in pipe (1).
- Position pipe (1).



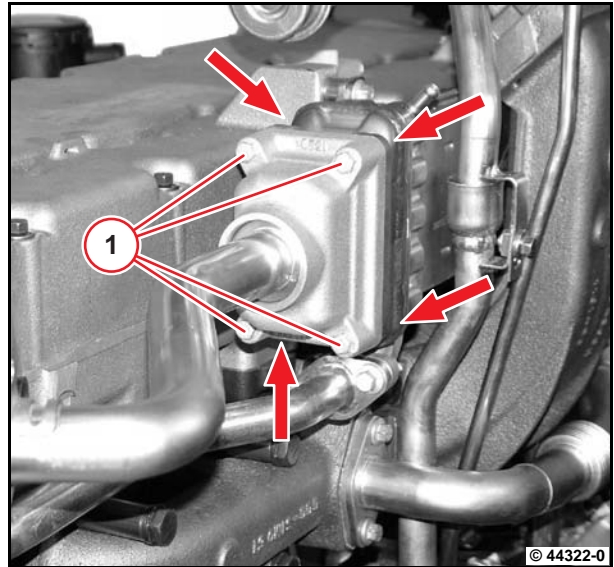
- Tighten screws (1).



A06 061



Hold nuts (arrows).

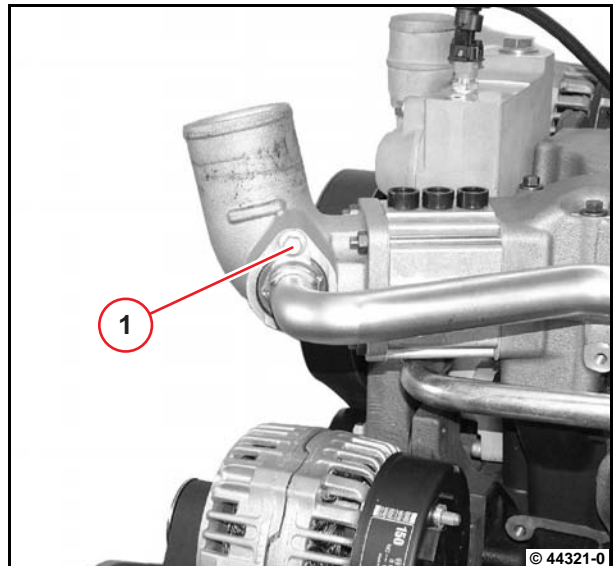


6

- Tighten screw (1).



A06 064







## Removing and installing the cooler (exhaust gas recirculation)



Commercial available tools



– Fitting compound  
DEUTZ AP1908



– W 06-09-03  
– W 06-09-06



Collect leaking operating substances in suitable vessels and dispose of according to regulations.  
The appropriate documentation of the vehicle/equipment manufacturer should be observed for emptying and filling the cooling system.

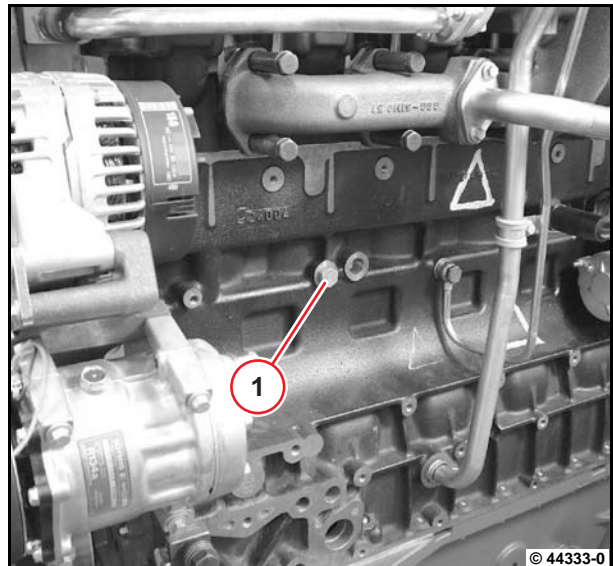
### Removing the cooler

- Remove flutter valve.



W 06-09-03

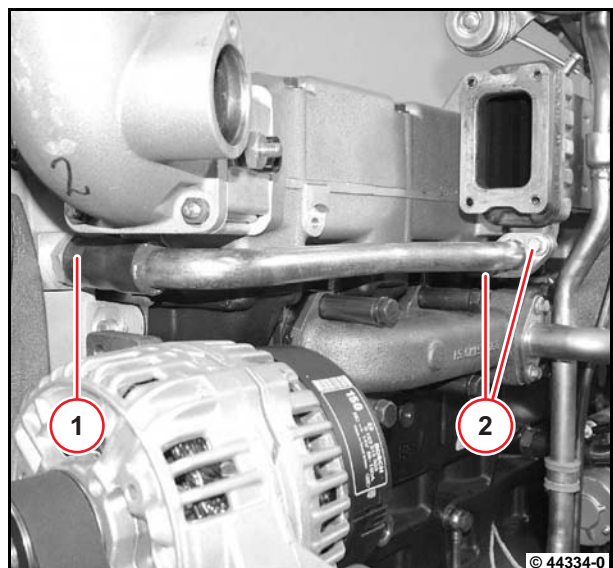
- Unscrew locking screw (1).
- Drain, collect and dispose of coolant according to regulations.



- Loosen pipe clamp (1).
- Unscrew screws (2).
- Pull off pipe.



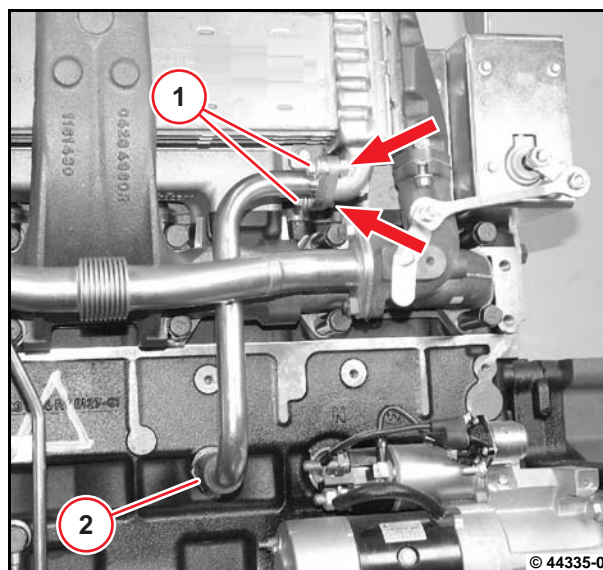
Collect and dispose of coolant according to regulations.



- Unscrew screws (1).
- Hold lock nuts (arrow).
- Loosen pipe clip (2).



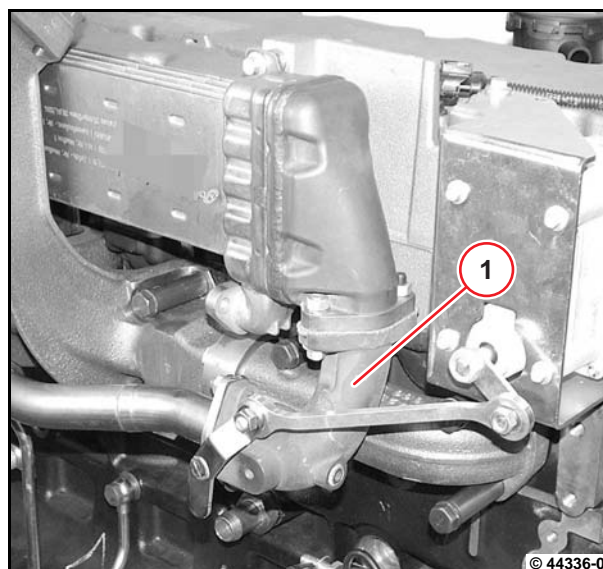
Collect and dispose of coolant according to regulations.



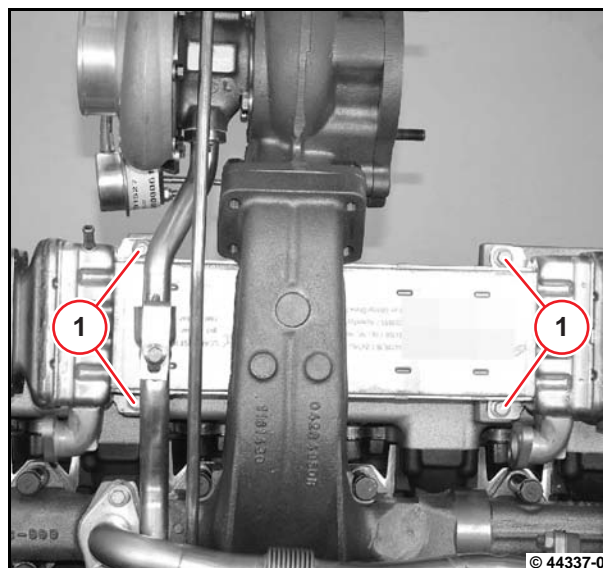
- Remove shutoff valve (1).



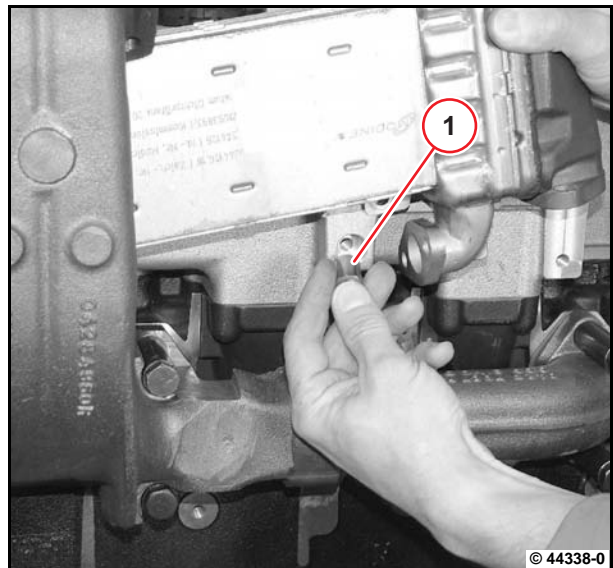
W 06-09-06



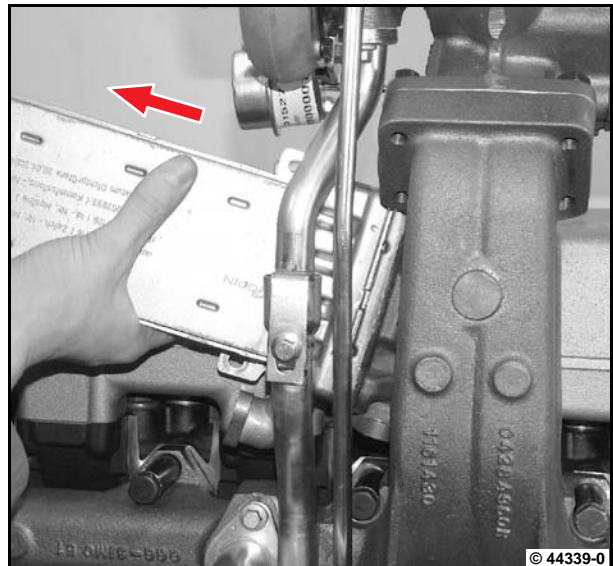
- Unscrew screws (1).



- Remove spacing sleeves (1).

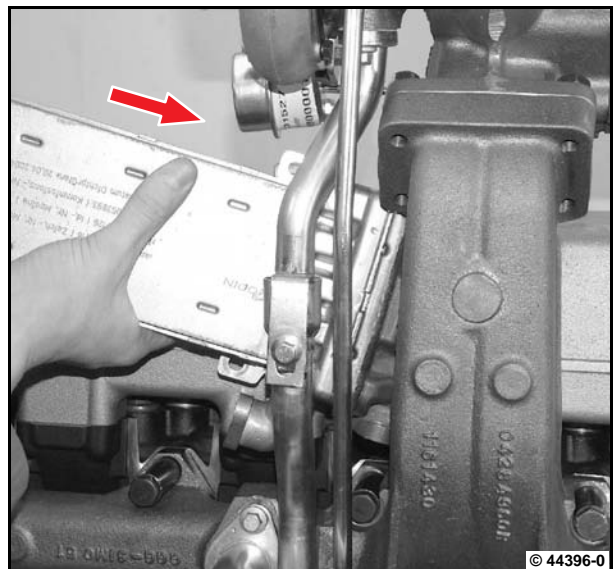


- Remove cooler from the side.

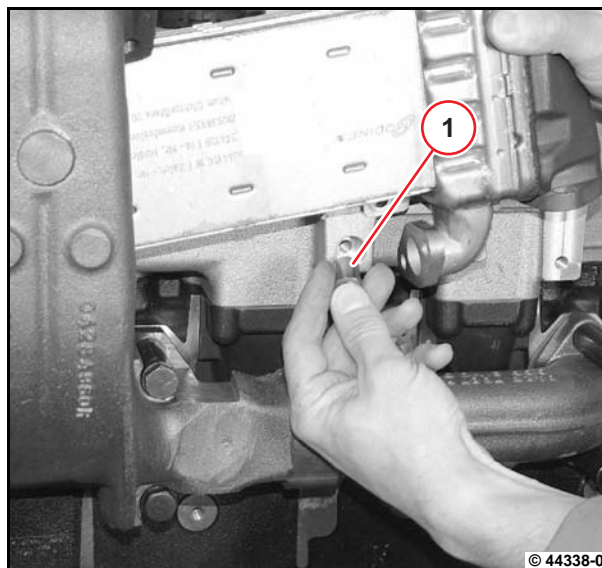


## Installing the cooler

- Insert cooler from the side.



- Insert spacing sleeves (1).



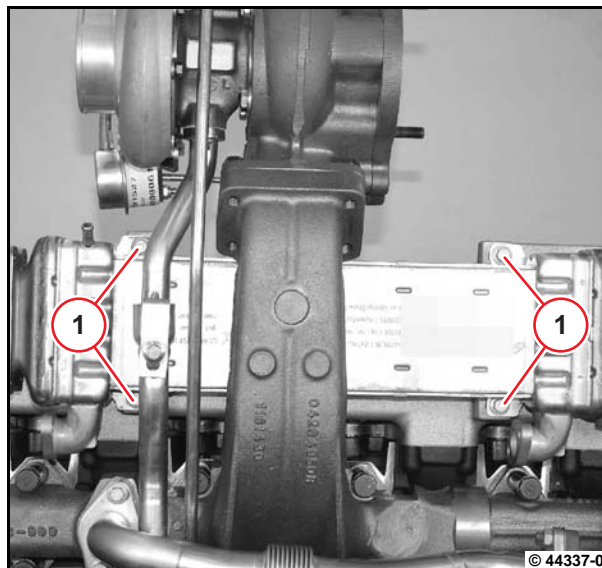
- Insert all screws (1).
- Tighten screws (1).



A06 060



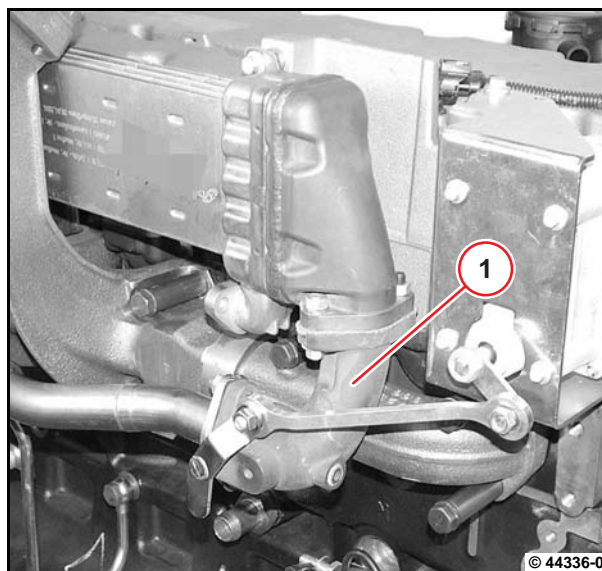
Tighten screws evenly.



- Install shutoff valve (1).



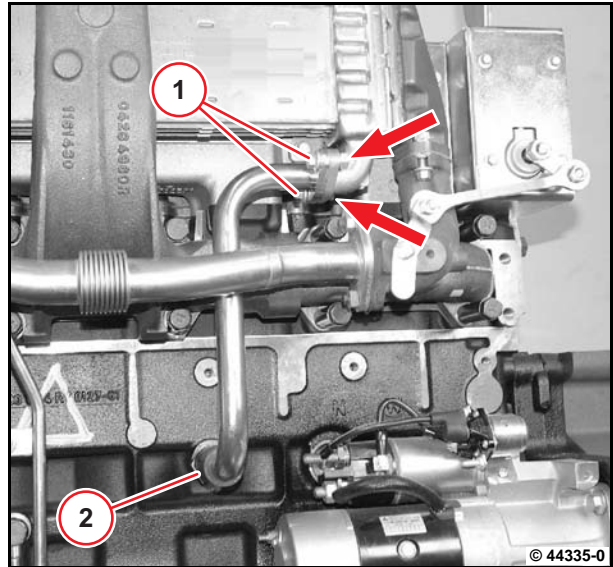
W 06-09-06





- Tighten screws (1).
- Hold lock nuts (arrow).
- Tighten screws (1).

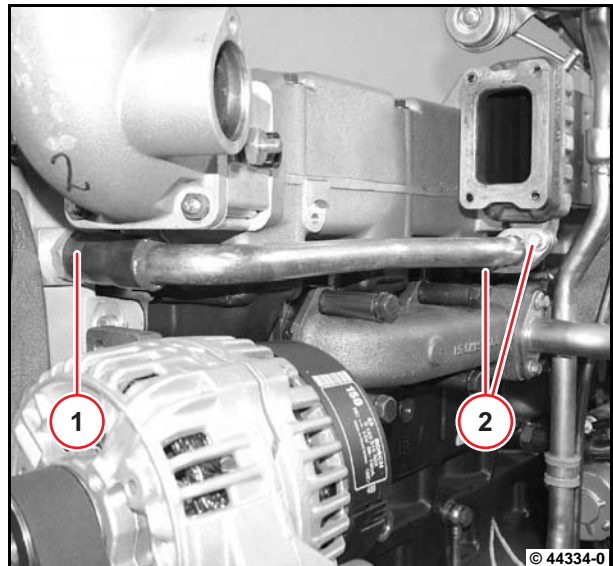
 A09 080



6

- Push on coolant pipe.
- Tighten pipe clip (1).
- Tighten screws (2).

 A09 080

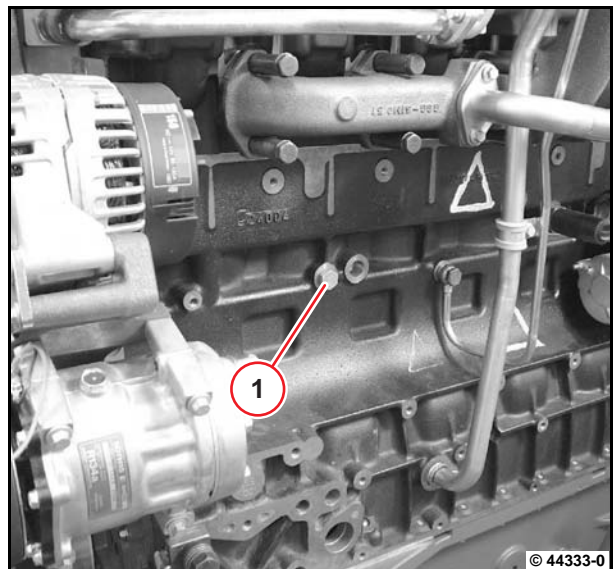


- Tighten screw plug (1).

 A03 007

- Install flutter valve.

 W 06-09-03





## Removing and installing the actuator (exhaust gas recirculation)



Commercial available tools



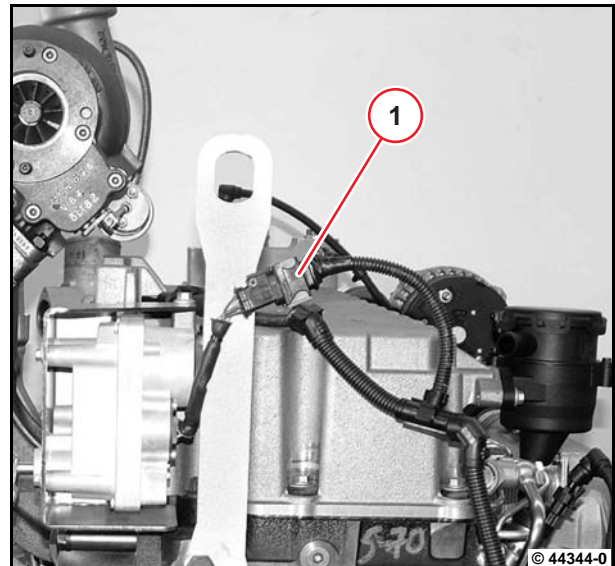
### Attention!

Do not apply current to the actuator when removed.

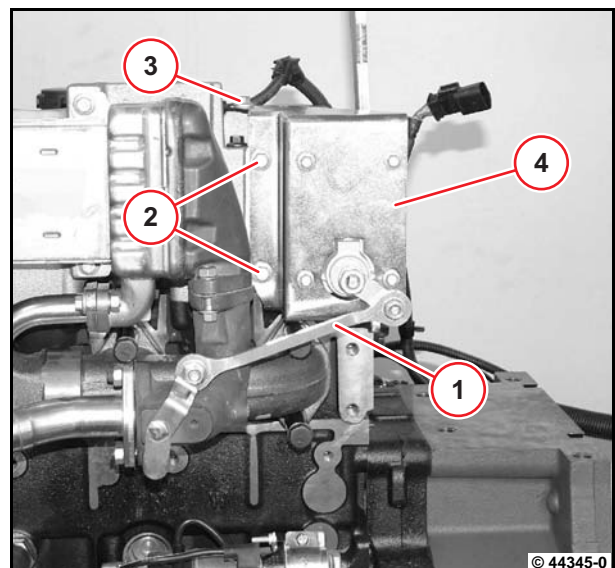
A current may only be applied to the actuator after perfect connection of all function-relevant parts and connections of the exhaust gas recirculation.

### Removing actuator

- Pull out cable plug (1).



- Remove adjusting rod (1).
- Unscrew screws (2).
- Loosen screw (3).
- Remove actuator (4).



## Installing actuator

- Insert actuator (4).
- Tighten screws (2).

 A06 066

- Tighten screws (3).

 A06 066

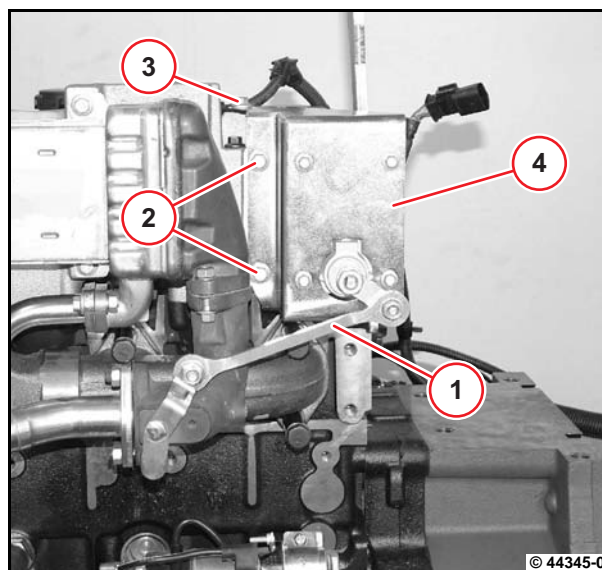
- Mount adjusting rod (1).

- Tighten nut.

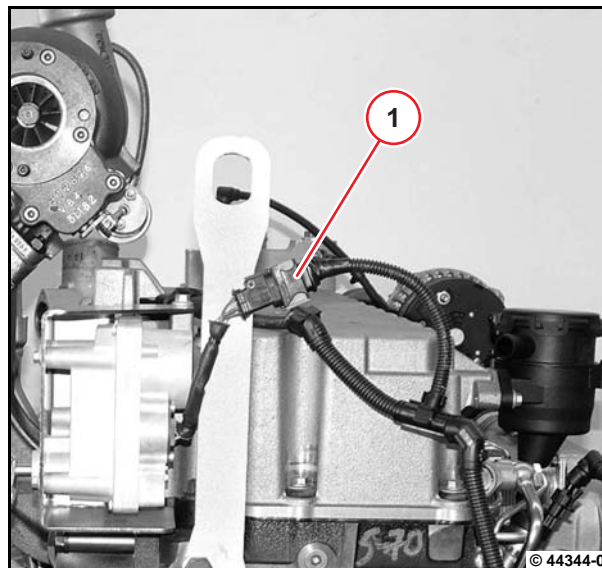
 A06 068



Pay attention to smooth action of the moving parts.



- Plug in the cable plug (1).





## Removing and installing the shutoff valve (exhaust gas recirculation)

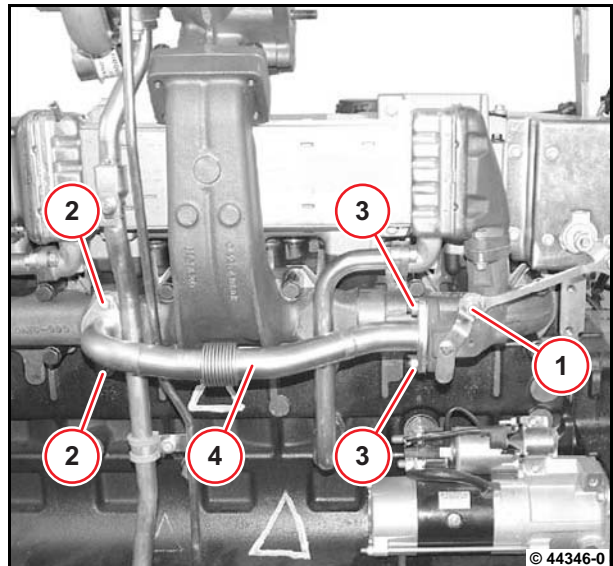


Commercial available tools

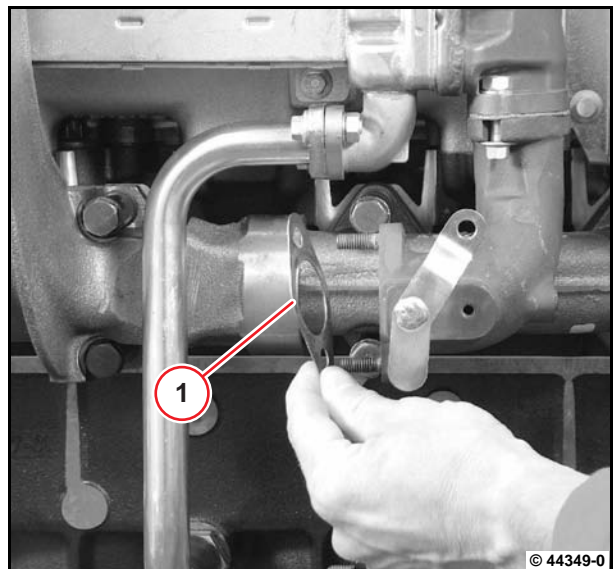
6

### Removing the shutoff valve

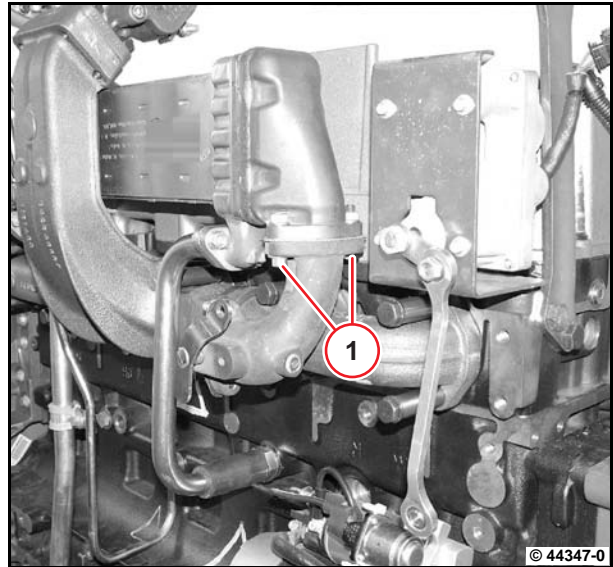
- Unscrew the adjusting bar (1).
- Unscrew screws (2).
- Unscrew nuts (3).
- Remove pipe (4).



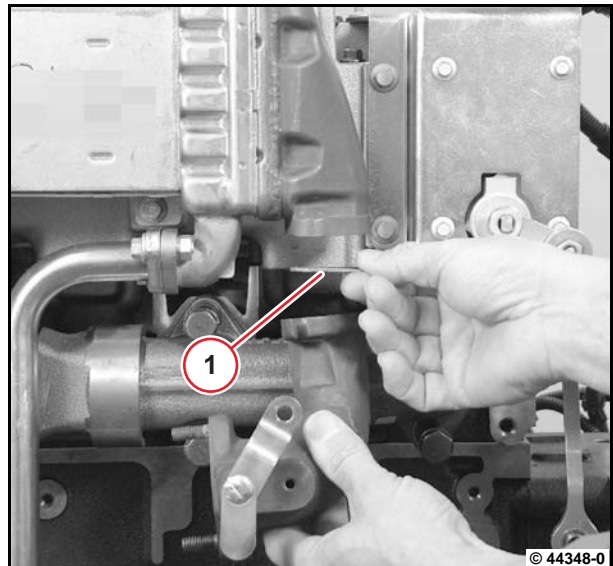
- Remove gasket (1).



- Unscrew screws (1).

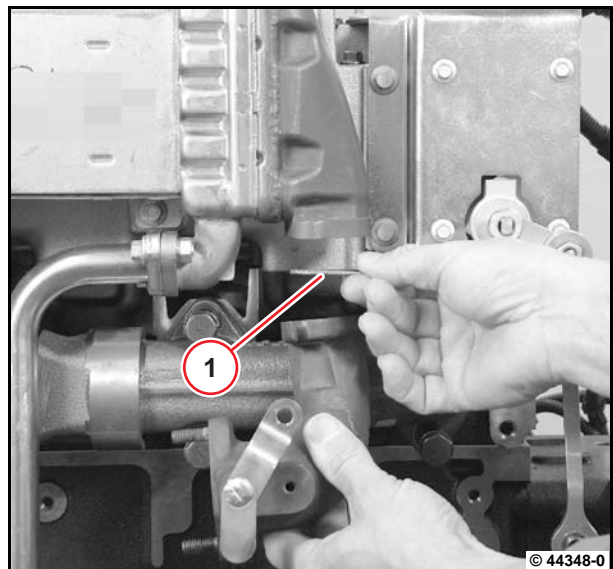


- Remove shutoff valve.
- Remove gasket (1).



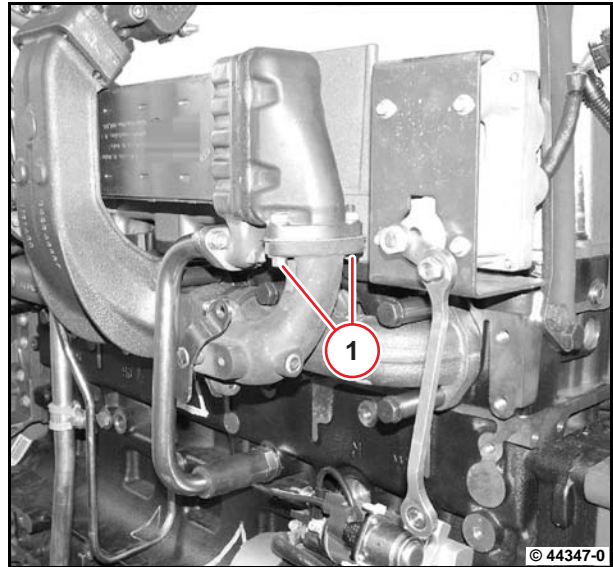
### **Installing the shutoff valve**

- Insert new seal (1).



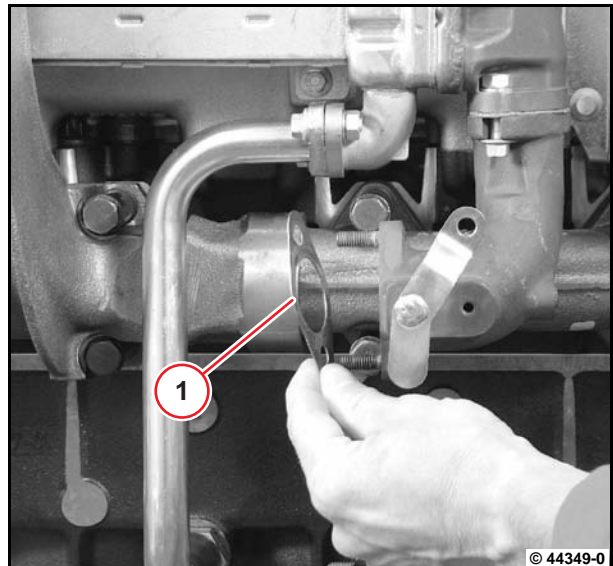
- Tighten screws (1).

 A06 062



6

- Insert new seal (1).



- Insert pipe (4).
- Tighten screws (2).

 A06 063

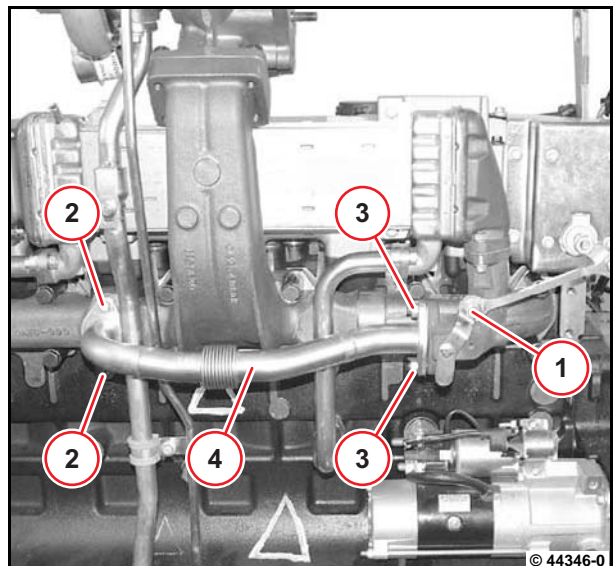
- Tighten nuts (3).

 A06 063

- Mount adjusting rod (1).

- Tighten nut.

 A06 068





## Removing and installing the fuel supply pump



Commercial available tools

Special tools:

- Disassembly tool . . . . . 110901
- Plugs/caps . . . . . 170160



– User notes



### **Danger!**

Wait 30 seconds after switching off the engine before working on the fuel system.



### **Attention!**

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean plugs/caps.

Do not remove plugs/caps until immediately before assembling.

Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

## Removing the fuel supply pump



### **Danger!**

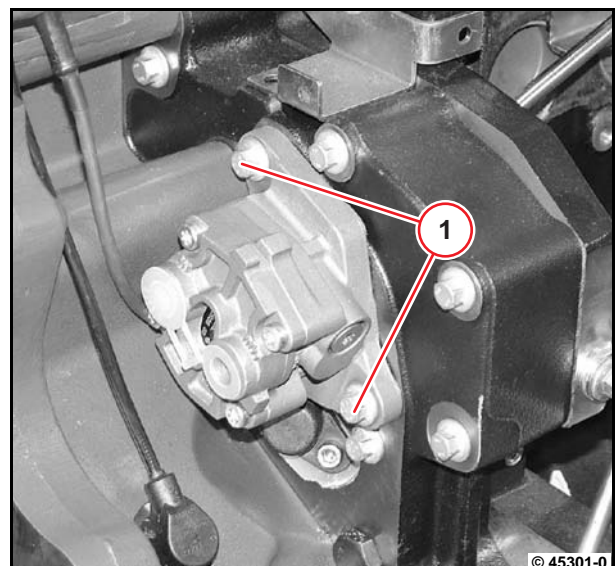
Wait 30 seconds after switching off the engine before working on the fuel system.

- Remove fuel pipes from fuel supply pump.
- Remove sealing rings.



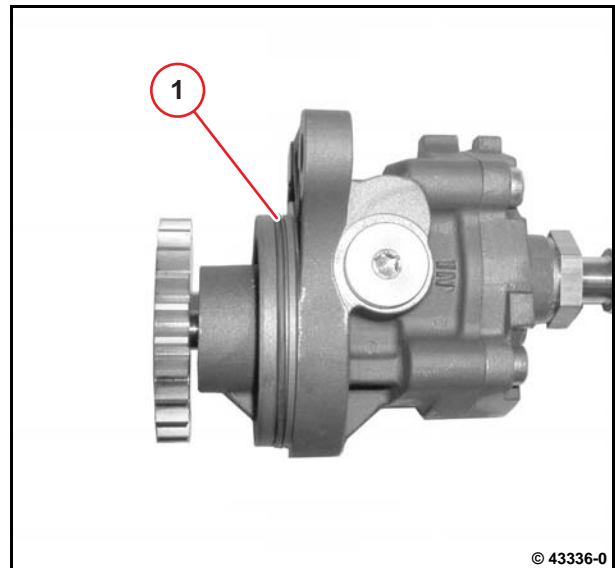
Collect draining fuel and dispose of according to regulations.

- Unscrew screws (1).
- Remove fuel supply pump.



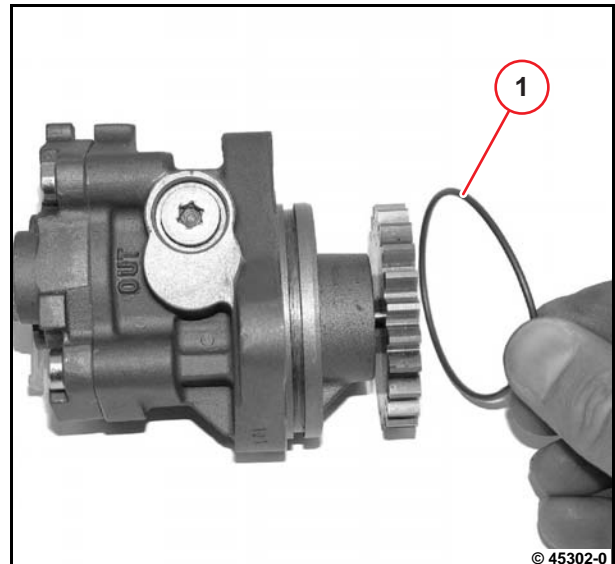


- Remove the O-ring (1) with the disassembly tool.
- Visually check the fuel supply pump.



### Installing the fuel supply pump

- Clean contact surfaces.
- Mount new O-ring (1).



- Install fuel pump.
- Tighten screws (1).

 **A07 024**

- Mount the fuel pipe at the fuel connection (2).

 **A07 045**

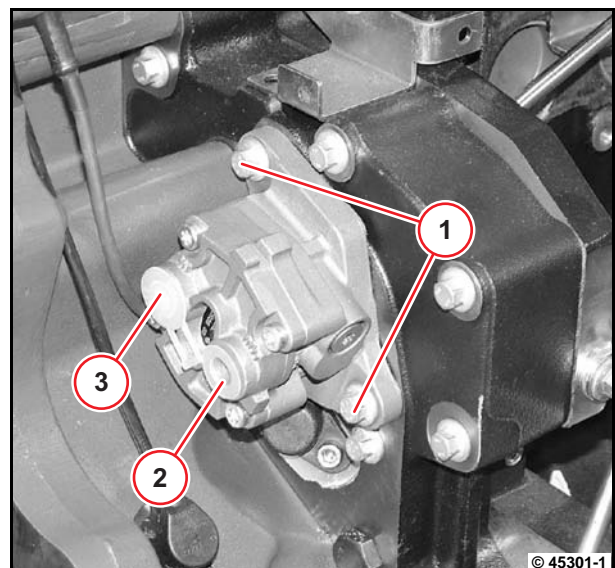


Use new sealing rings.

- Mount the fuel pipe at the fuel connection (3).



Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operation manual.



## Removing and installing the control block



Commercial available tools

Special tools:

– Plugs/caps ..... 170160



– User notes



### Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



### Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean plugs/caps.

Do not remove plugs/caps until immediately before assembling.

Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

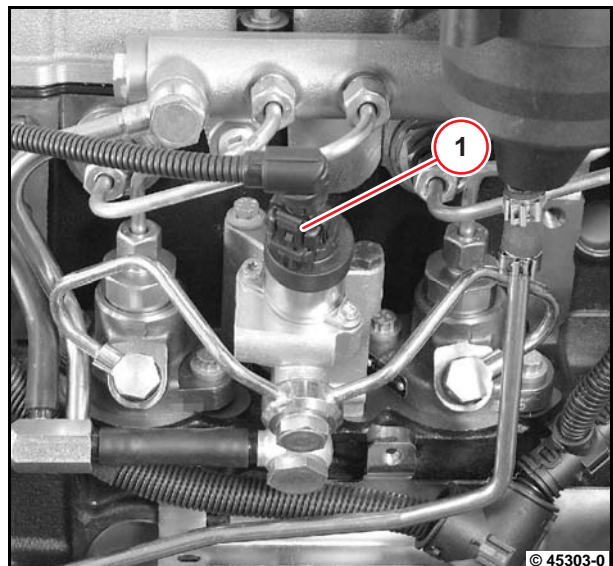
## Removing the control block



### Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

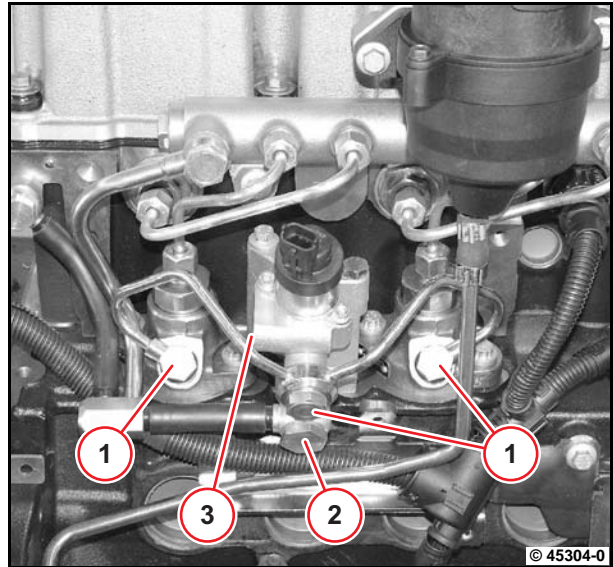
- Unlock cable plug (1) and remove.



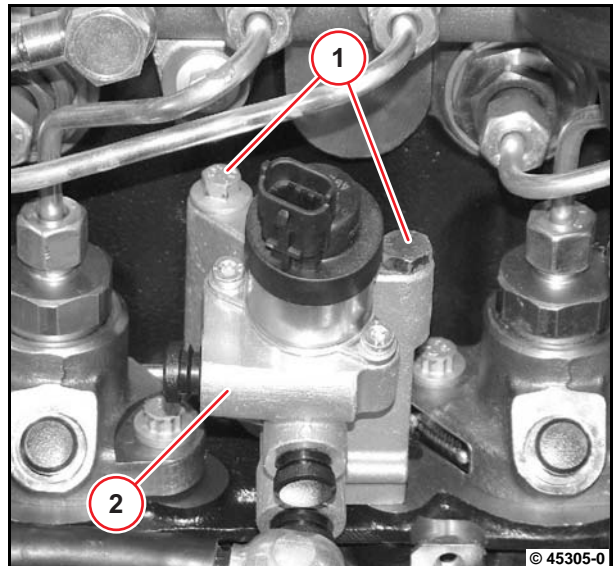
- Unscrew hollow screws (1).
- Remove fuel pipe and sealing rings.
- Unscrew hollow screw (3).
- Remove sealing rings.
- Unscrew hollow screw (2).
- Remove sealing rings.



Collect draining fuel and dispose of according to regulations.



- Unscrew screws (1).
- Remove control block (2).

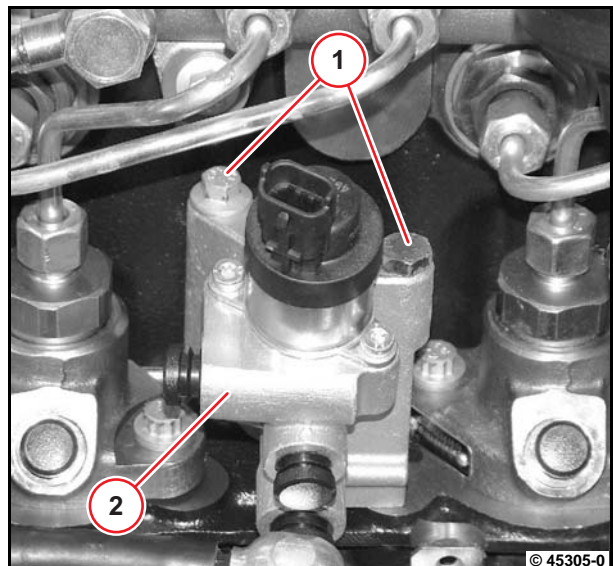


### Installing the control block

- Insert control block (2).
- Screw in screws (1).



Pay attention to different screw lengths.  
Do not tighten screws.







Use new sealing rings.

- Install fuel pipes. Insert hollow screws (1), (2), (3) and (4) tension-free with new sealing rings.
- Tighten hollow screws according to the tightening sequence.

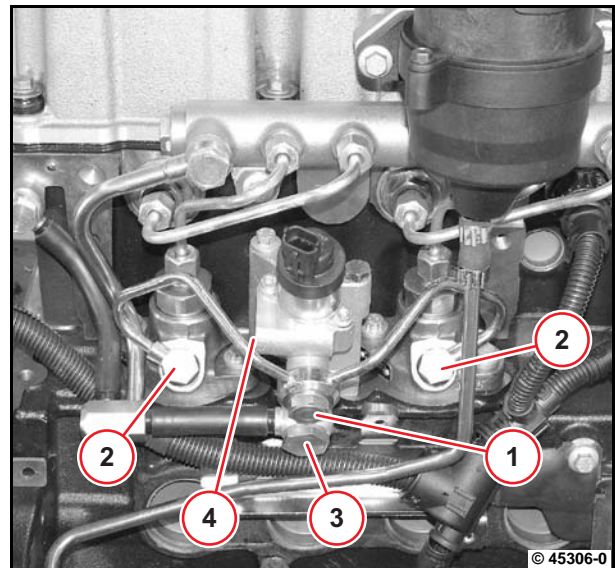
1. Hollow screw (1):

 A07 035

2. Hollow screws (2):

 A07 034

- Check the fuel pipes for perfect installation position.



6

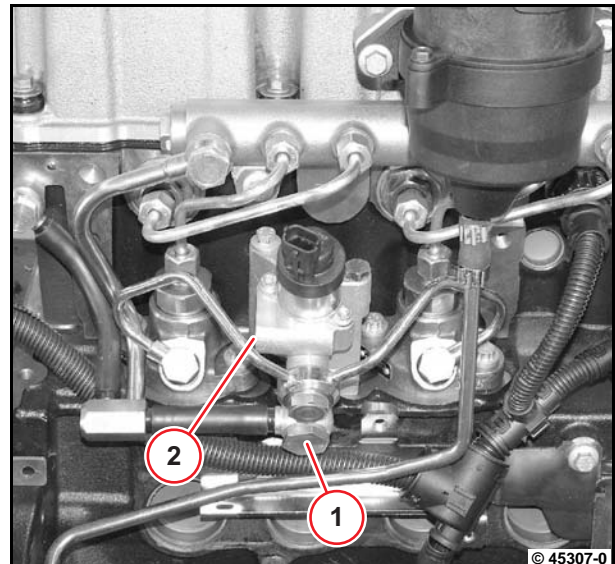
- Tighten hollow screw (1).

 A07 046

- Tighten hollow screw (2).

 A07 045

- Check the fuel pipes for perfect installation position.



- Tighten screws (1).

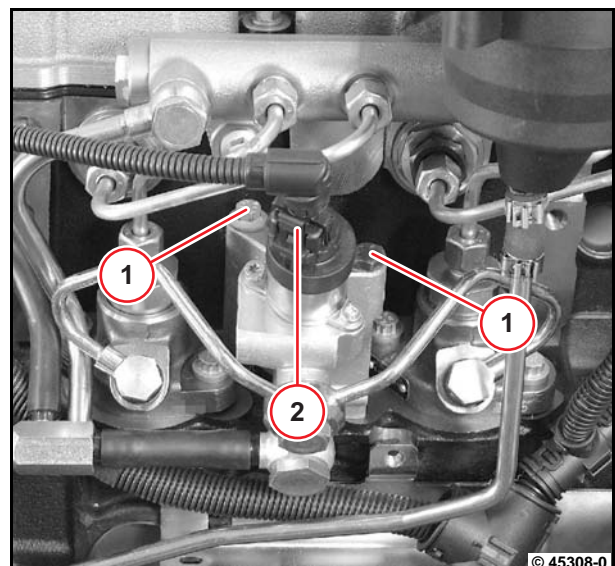
 A07 032

- Plug in the cable plug (2).



Ensure that the connection is perfect.

Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operation manual.





## Removing and installing the high-pressure pump (Installation position A)



Commercial available tools:

- Socket wrench set  
10 mm, 12-side

Special tools:

- Turn-over gear . . . . . 100370
- Assembly pliers. . . . . 103220
- Special wrench . . . . . 110500
- Assembly case with  
assembly sleeves, guides  
and disassembly tool . . . . . 110900
- Plugs/caps . . . . . 170160



- Fitting compound  
DEUTZ AP1908



– User notes



### **Danger!**

Wait 30 seconds after switching off the engine before working on the fuel system.



### **Attention!**

Ensure utmost cleanliness when working on the fuel system.  
Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.  
Observe the safety regulations and national specifications for handling fuels.  
Close all connections immediately after opening with new, clean plugs/caps.  
Do not remove plugs/caps until immediately before assembling.  
Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

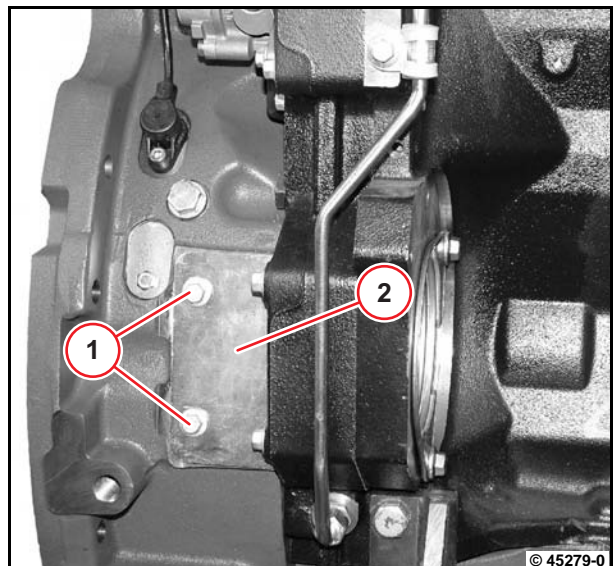
## Removing the high-pressure pump



### **Danger!**

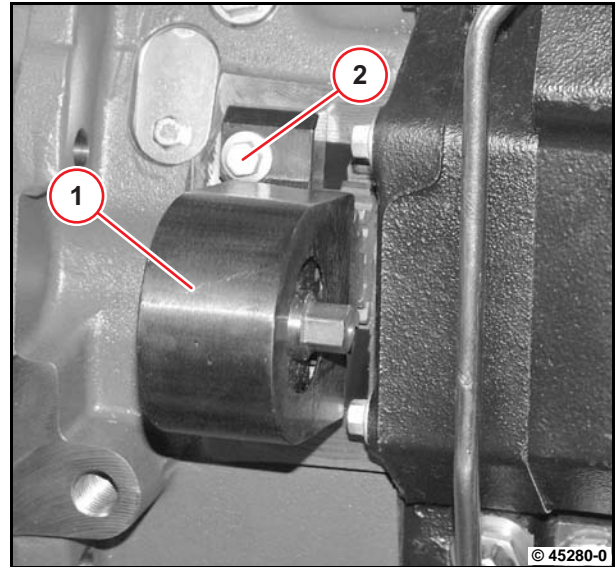
Wait 30 seconds after switching off the engine before working on the fuel system.

- Unscrew screws (1).
- Remove cover (2).

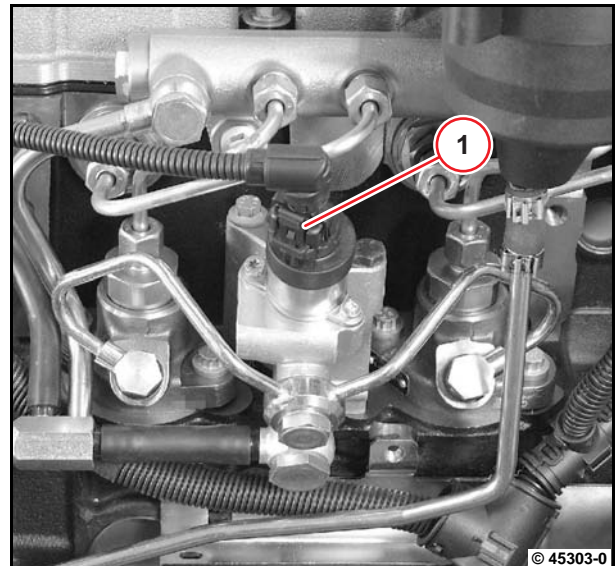


- Insert turn-over gear (1).
- Tighten screw (2).

 A03 085



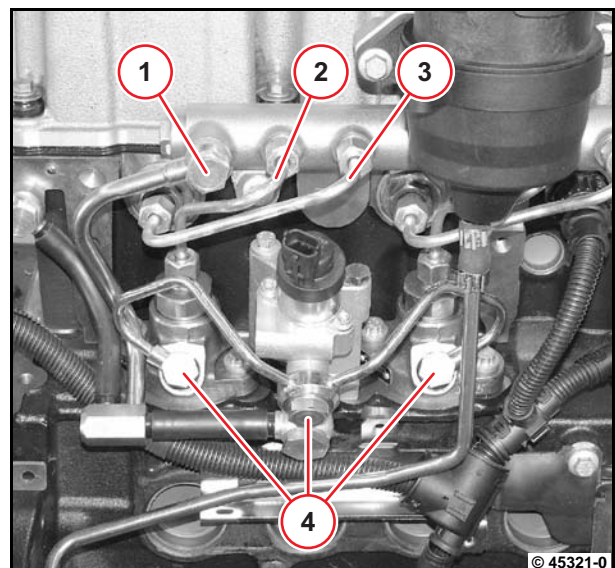
- Unlock cable plug (1) and remove.



- Unscrew hollow screw (1).
- Remove sealing rings.
- Unscrew hollow screws (4).
- Remove fuel pipe and sealing rings.
- Injection pipe (3) with special wrench.
- Remove high pressure pipe (2) with special wrench.



Support the pipe connection of the high pressure pump.  
Collect draining fuel and dispose of according to regulations.





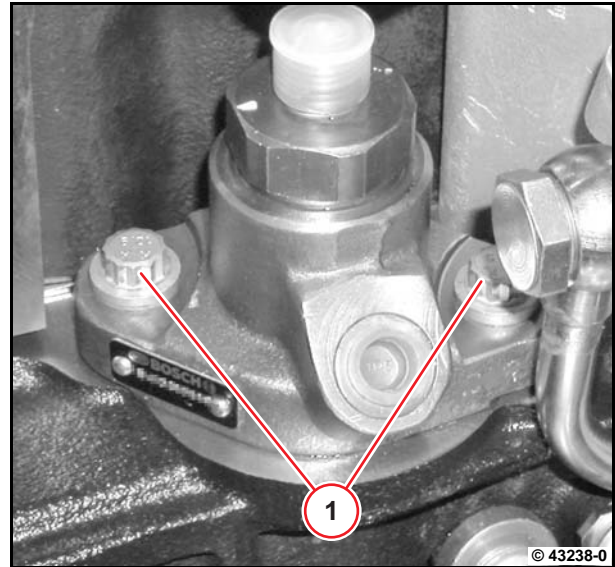
- Loosen screws (1).



Loosen screws evenly to avoid jamming the high-pressure pump.

If necessary, turn the crankshaft with turn-over gear in the direction of rotation of the engine until the high-pressure pump is felt to release.

- Unscrew screws (1) evenly.
- Remove high pressure pump.



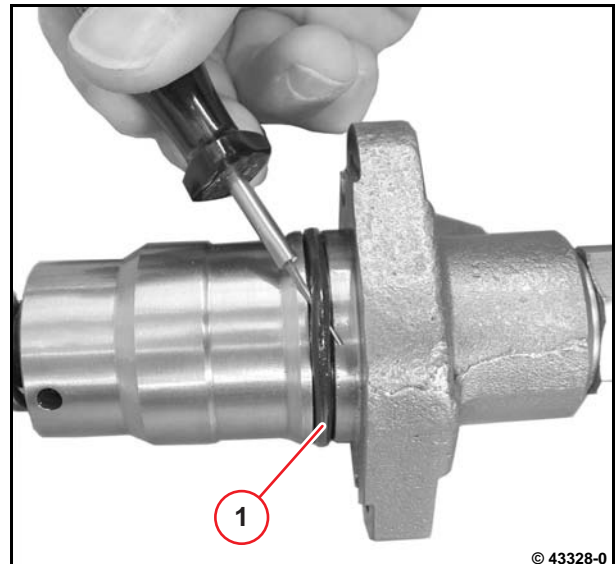
6

- Carefully remove the O-ring (1) from the high-pressure pump with the disassembly tool.

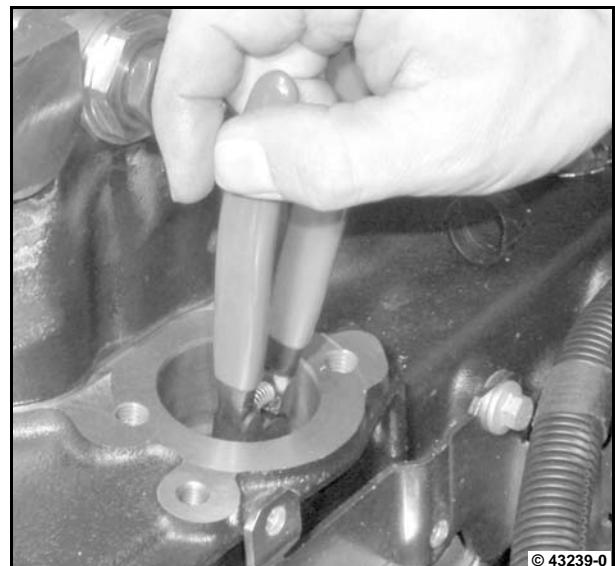


### Attention!

Do not damage the high-pressure pump.



- Pull out roller tappet with assembly pliers.
- Visually inspect the component.

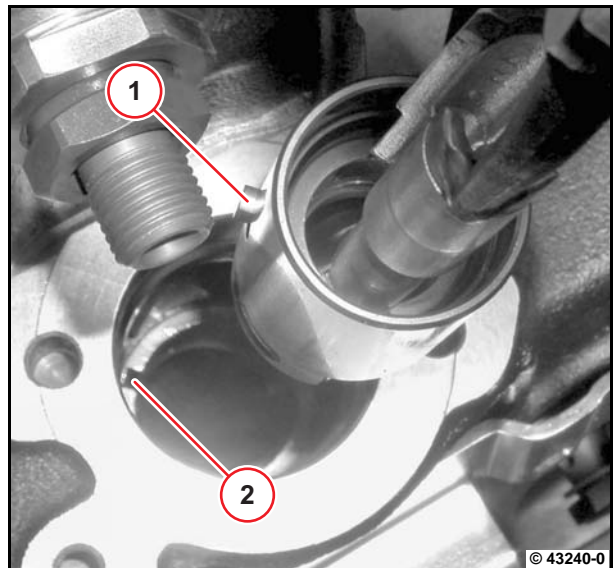


## Installing the high-pressure pump

- Oil the roller tappet slightly and insert carefully with the assembly pliers.



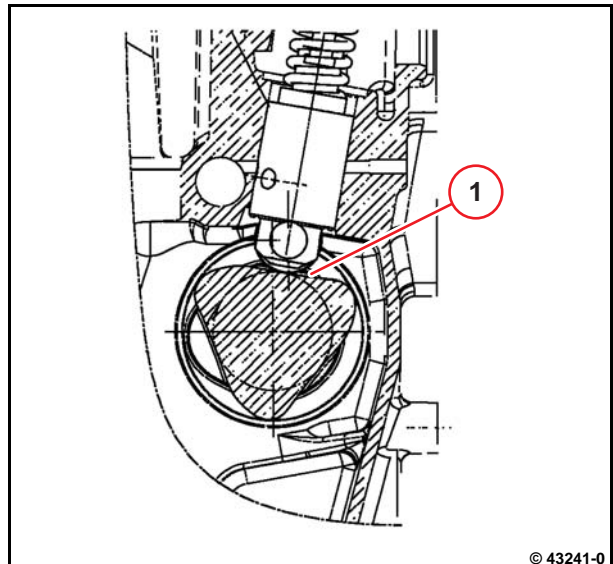
The guide pin (1) on the roller tappet must grip in the groove (2).



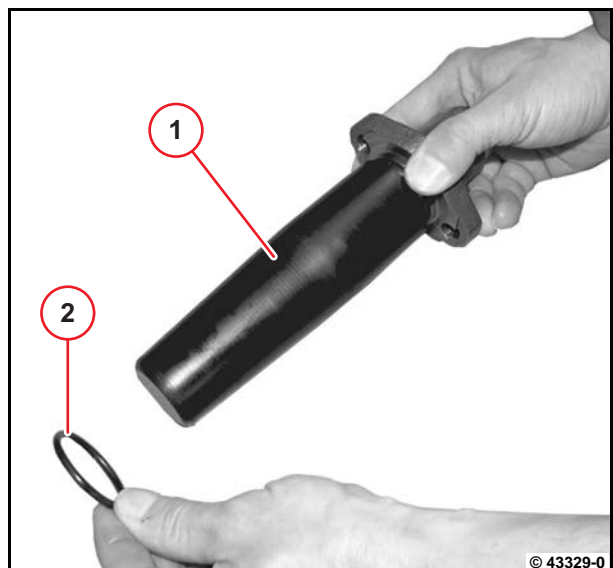
- Turn the crankshaft until the cam for the high pressure pump is on the cam basic circle (1) (roller tappet stroke < 0.5 mm).



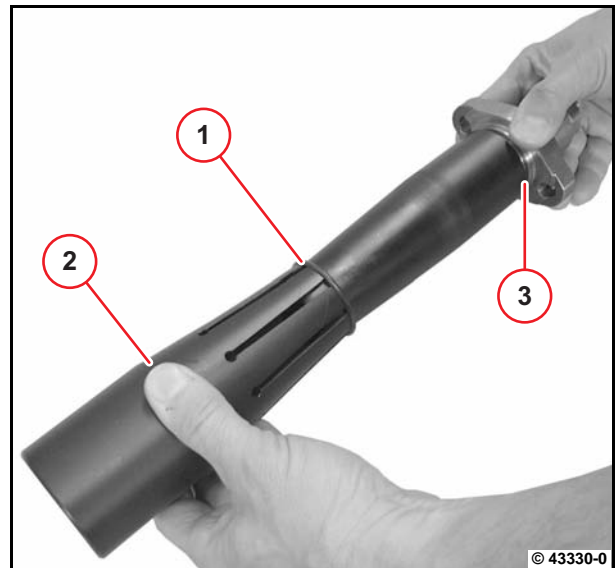
Use turning gear.



- Push assembly guide (1) onto high-pressure pump.
- Push the new O-ring (2) onto the assembly guide.

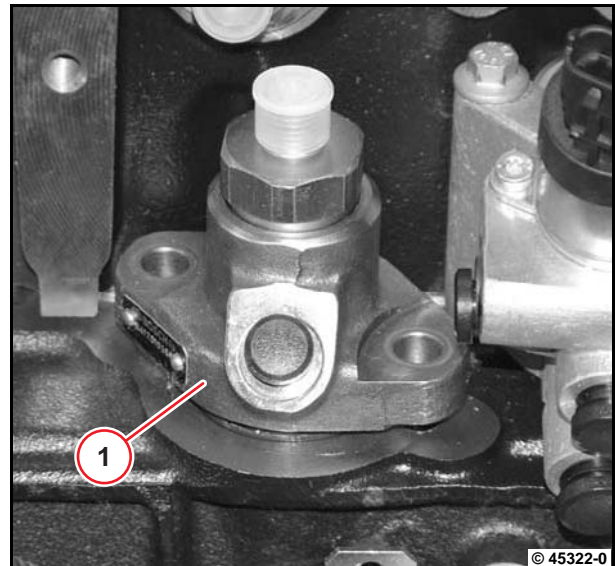


- Push the O-ring (1) with assembly sleeve (2) up to the groove (3).
- Coat the O-ring, mounting bore and chamfers in the crankcase with fitting compound.



6

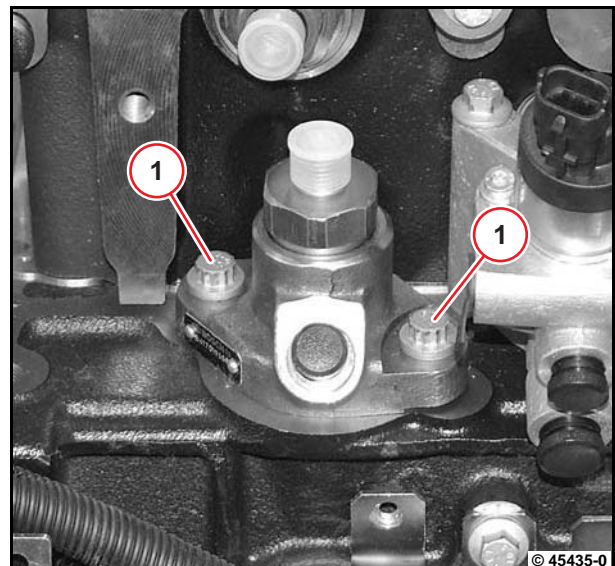
- Insert the high pressure pump (1) carefully in the crankcase.



- Screw in the screws (1) evenly (alternately).



Do not tighten the screws yet.







Use new sealing rings.

- Install fuel pipe. Insert hollow screws (1) and (2) with new sealing rings tension-free.
- Tighten hollow screws according to the tightening sequence.

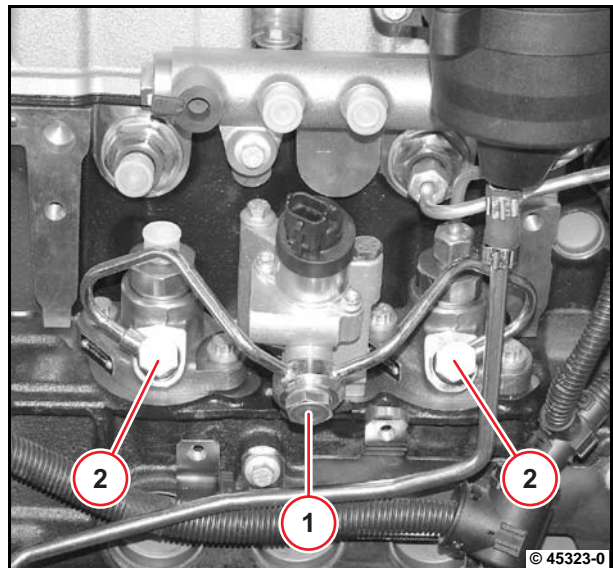
1. Hollow screw (1):

 A07 035

2. Hollow screws (2):

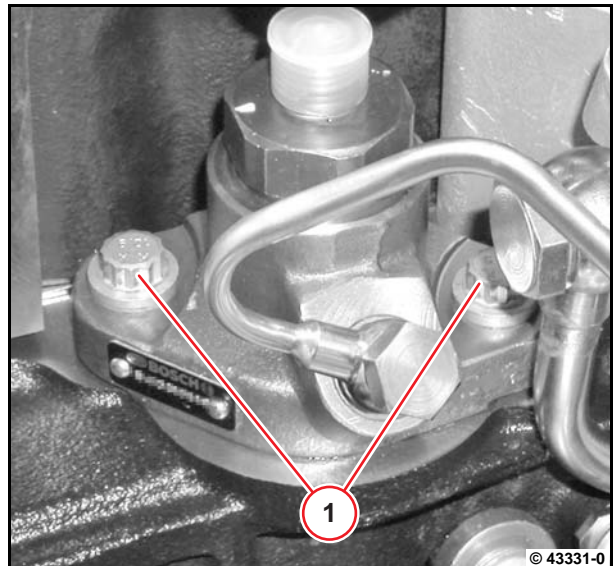
 A07 034

- Check the fuel pipes for perfect installation position.



- Tighten screws (1) evenly.

 A07 031



### Attention!

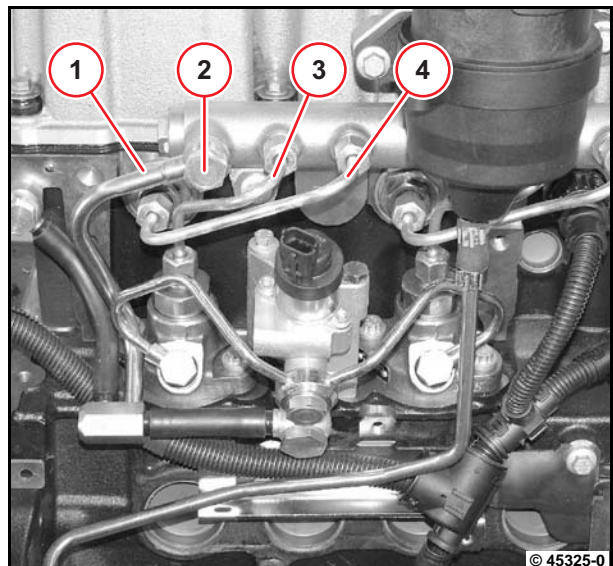
The high pressure pipes and injection pipes must always be renewed after disassembly.

- Mount new high pressure pipe (3) and new injection pipe (4) with special wrench.

 A07 003

- Check the high pressure pipe and injection pipe for perfect installation position.
- Mount return pipe (1).
- Tighten hollow screw (2) with new sealing rings.

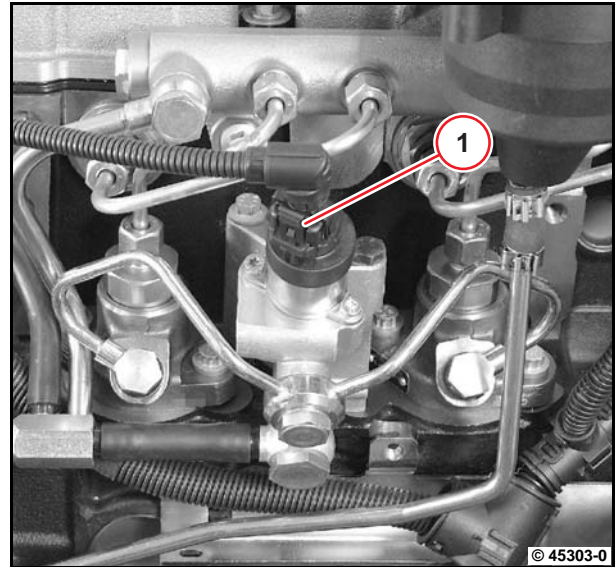
 A07 045



- Plug in the cable plug (1).

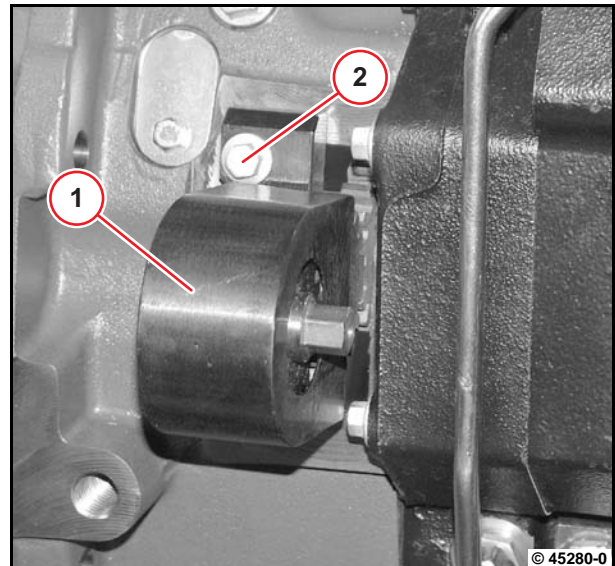


Ensure that the connection is perfect.



6

- Unscrew screw (2).
- Remove turning gear (1).



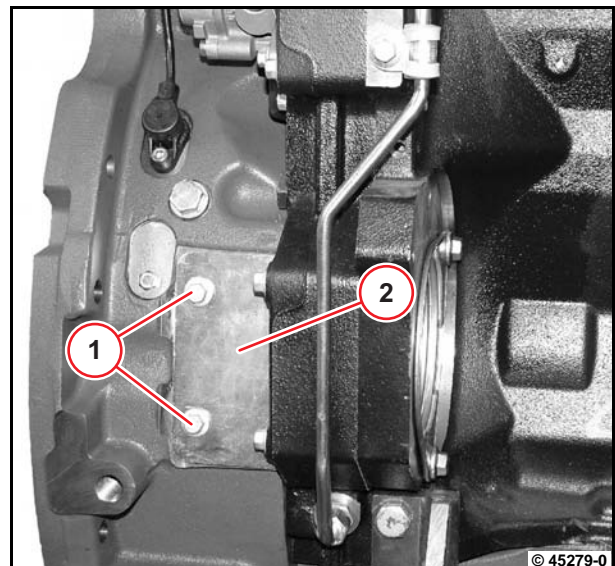
- Mount cover (2).
- Tighten screws (1).



A03 085



Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operation manual.





## Removing and installing the high-pressure pump (Installation position B)



Commercial available tools:

- Socket wrench set  
10 mm, 12-side
- Hose clip pliers . . . . . 8011

Special tools:

- Turn-over gear . . . . . 100360
- Assembly pliers. . . . . 103220
- Special wrench . . . . . 110500
- Assembly case with  
assembly sleeves, guides  
and disassembly tool . . . . . 110900
- Plugs/caps . . . . . 170160



- Fitting compound  
DEUTZ AP1908



- [User notes](#)
- [W 03-01-11](#)



### **Danger!**

Wait 30 seconds after switching off the engine before working on the fuel system.



### **Attention!**

Ensure utmost cleanliness when working on the fuel system.  
Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.  
Observe the safety regulations and national specifications for handling fuels.  
Close all connections immediately after opening with new, clean plugs/caps.  
Do not remove plugs/caps until immediately before assembling.  
Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

## Removing the high-pressure pump



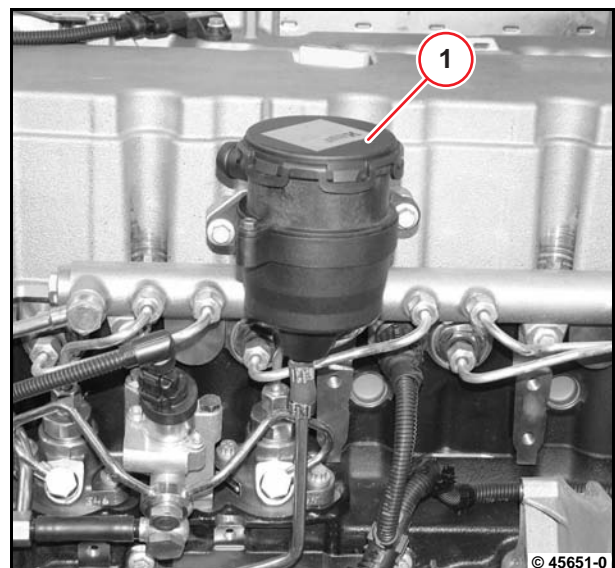
### **Danger!**

Wait 30 seconds after switching off the engine before working on the fuel system.

- Remove crankcase breather (1).

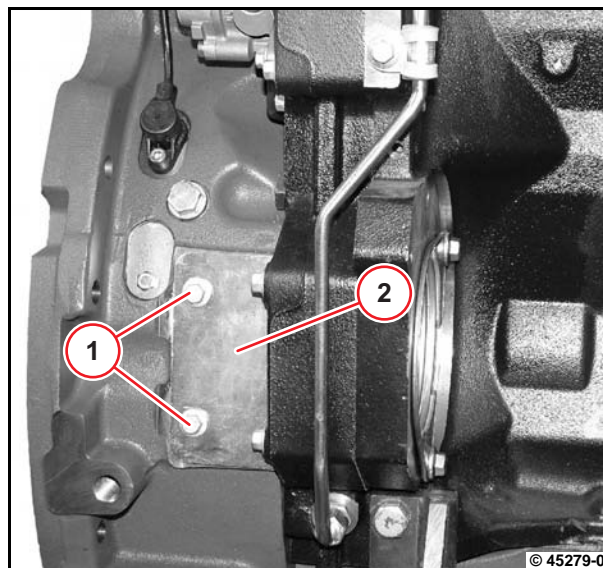


[W 03-01-11](#)



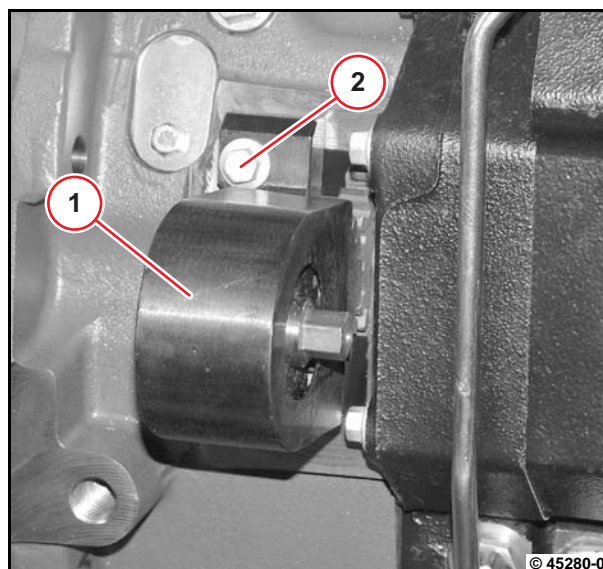


- Unscrew screws (1).
- Remove cover (2).

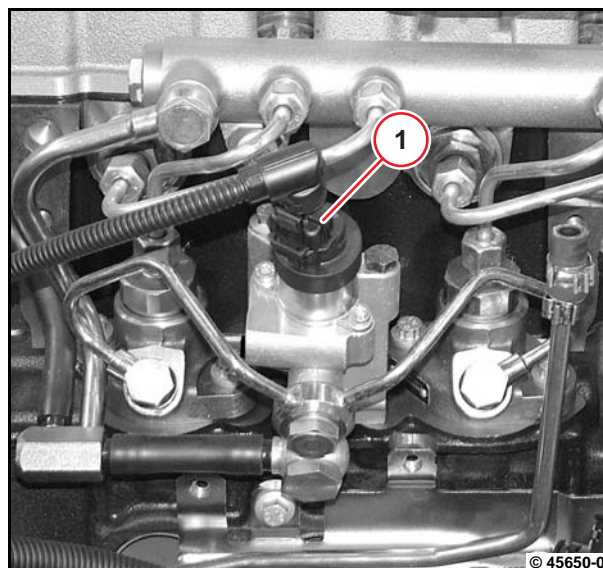


- Insert turn-over gear (1).
- Tighten screw (2).

 **A03 085**



- Unlock cable plug (1) and remove.

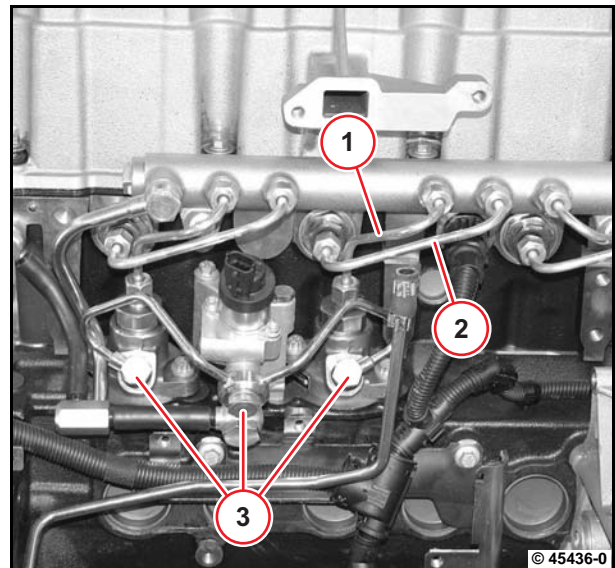


- Unscrew hollow screws (3).
- Remove fuel pipe and sealing rings.
- Remove injection pipe (2) with special wrench.
- Remove high pressure pipe (1) with special wrench.



Support the pipe connection of the high pressure pump.

Collect draining fuel and dispose of according to regulations.



6

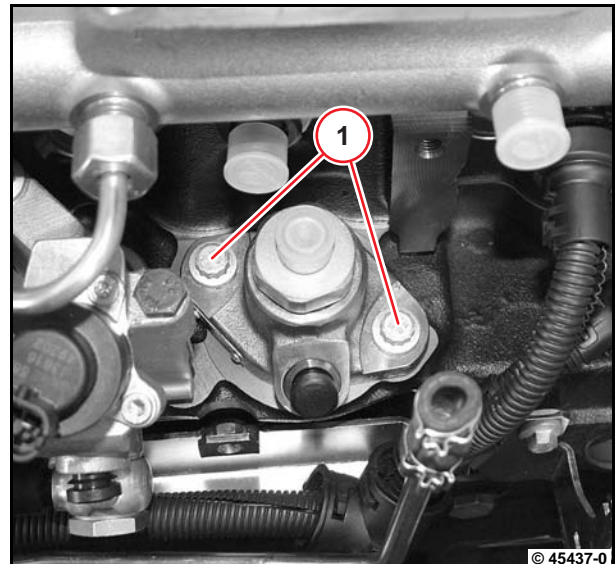
- Loosen screws (1).



Loosen screws evenly to avoid jamming the high-pressure pump.

If necessary, turn the crankshaft with turn-over gear in the direction of rotation of the engine until the high-pressure pump is felt to release.

- Unscrew screws (1) evenly.
- Remove high pressure pump.

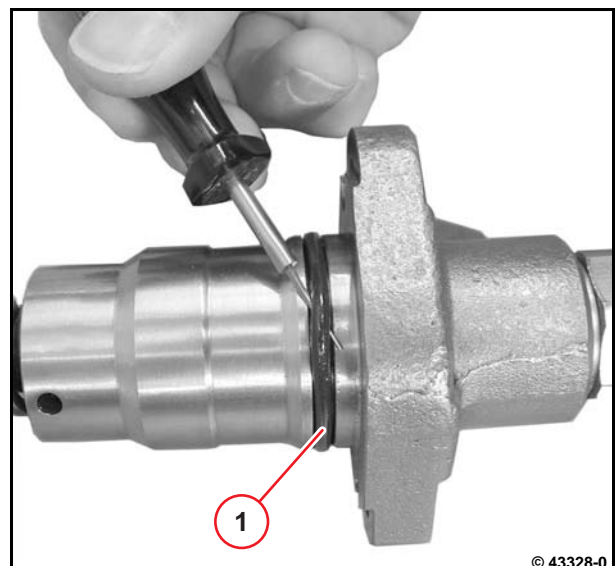


- Carefully remove the O-ring (1) from the high-pressure pump with the disassembly tool.

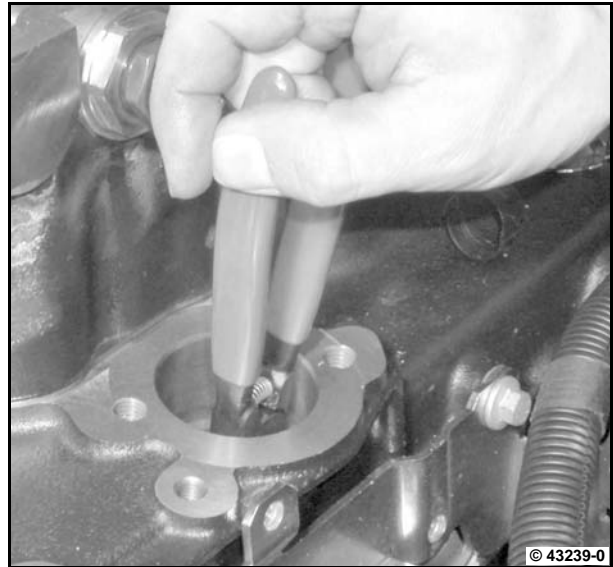


### Attention!

Do not damage the high-pressure pump.



- Pull out roller tappet with assembly pliers.
- Visually inspect the component.

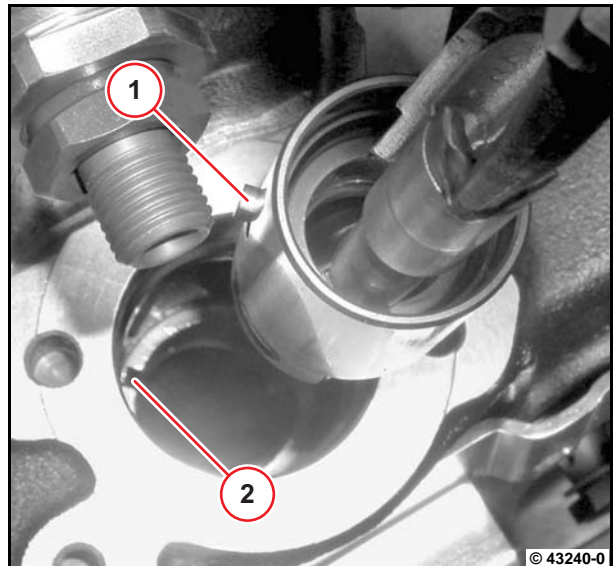


### Installing the high-pressure pump

- Oil the roller tappet slightly and insert carefully with the assembly pliers.



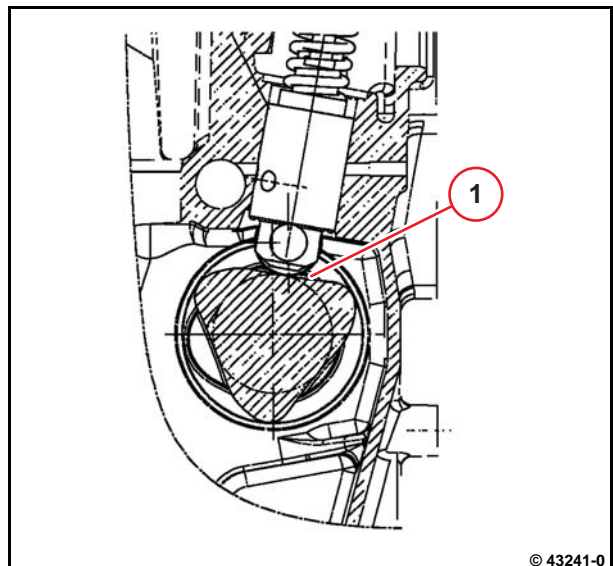
The guide pin (1) on the roller tappet must grip in the groove (2).



- Turn the crankshaft until the cam for the high pressure pump is on the cam basic circle (1) (roller tappet stroke < 0.5 mm).

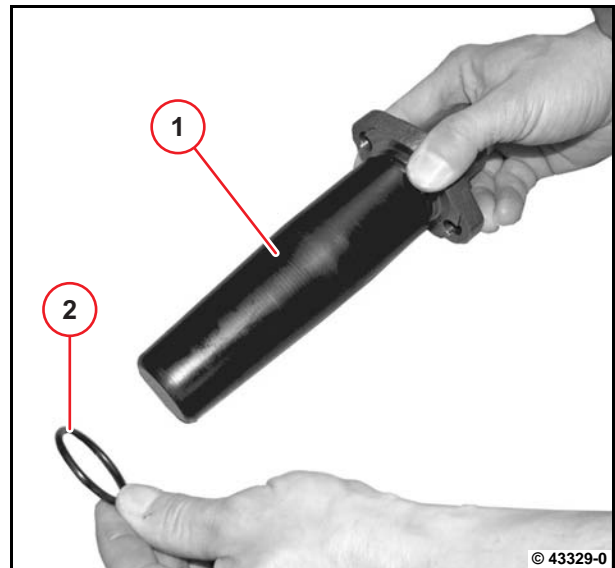


Use turning gear.

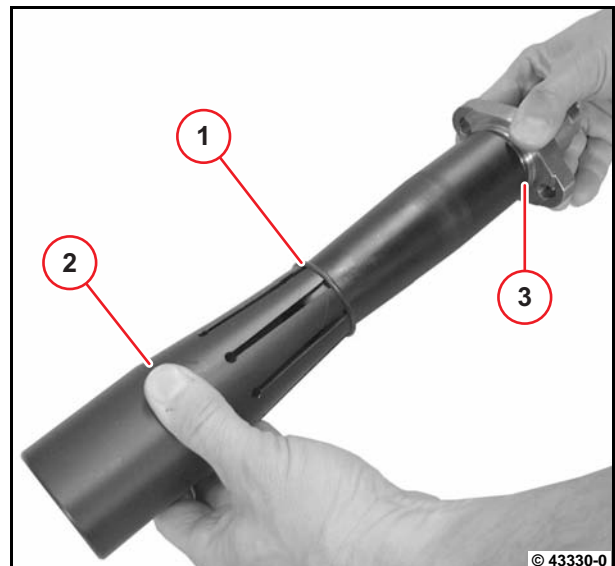




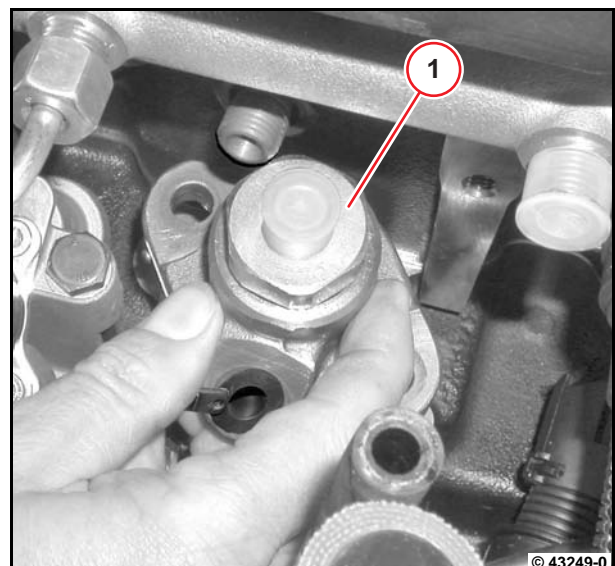
- Push assembly guide (1) onto high-pressure pump.
- Push the new O-ring (2) onto the assembly guide.



- Push the O-ring (1) with assembly sleeve (2) up to the groove (3).
- Coat the O-ring, mounting bore and chamfers in the crankcase with fitting compound.



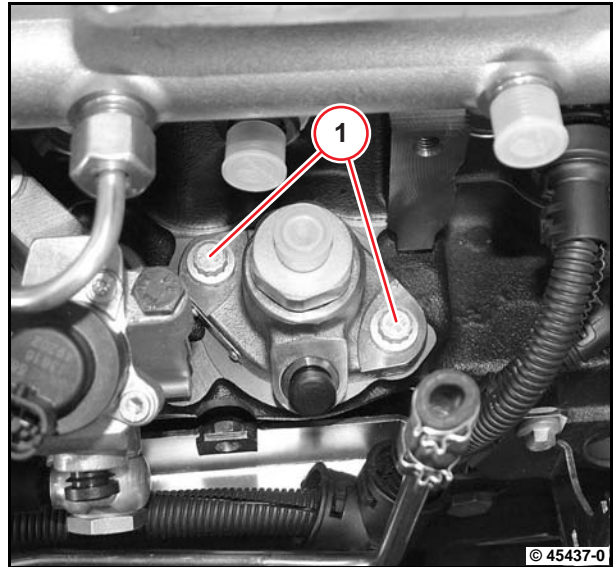
- Insert the high pressure pump (1) carefully in the crankcase.



- Screw in the screws (1) evenly (alternately).



Do not tighten the screws yet.



Use new sealing rings.

- Install fuel pipe. Insert hollow screws (1) and (2) with new sealing rings tension-free.
- Tighten hollow screws according to the tightening sequence.

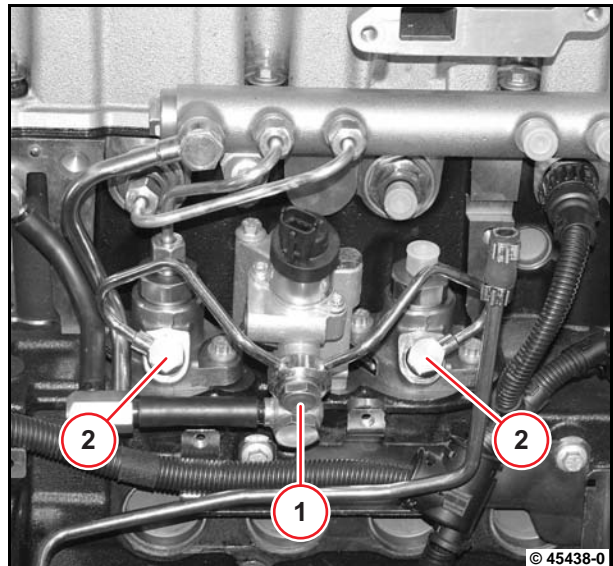
1. Hollow screw (1):

 **A07 035**

2. Hollow screws (2):

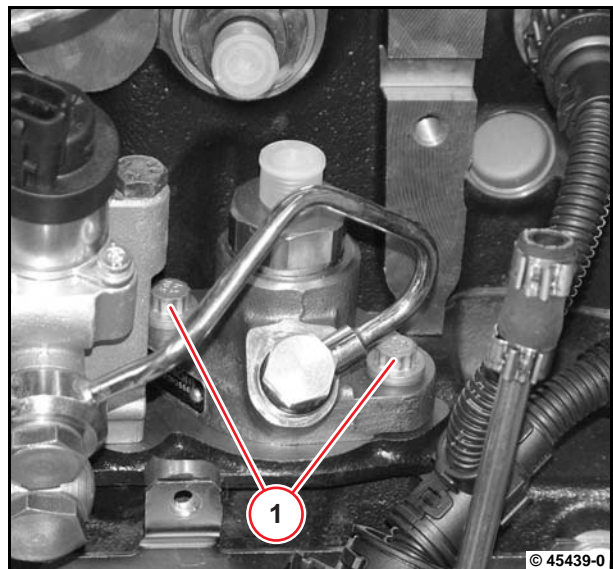
 **A07 034**

- Check the fuel pipes for perfect installation position.



- Tighten screws (1) evenly.

 **A07 031**





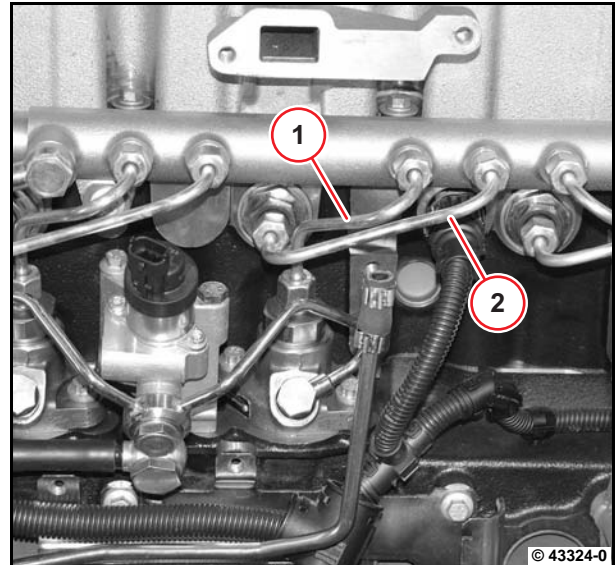
### Attention!

The high pressure pipes and injection pipes must always be renewed after disassembly.

- Mount new high pressure pipe (1) and new injection pipe (2) with special wrench.

 A07 003

- Check the high pressure pipe and injection pipe for perfect installation position.

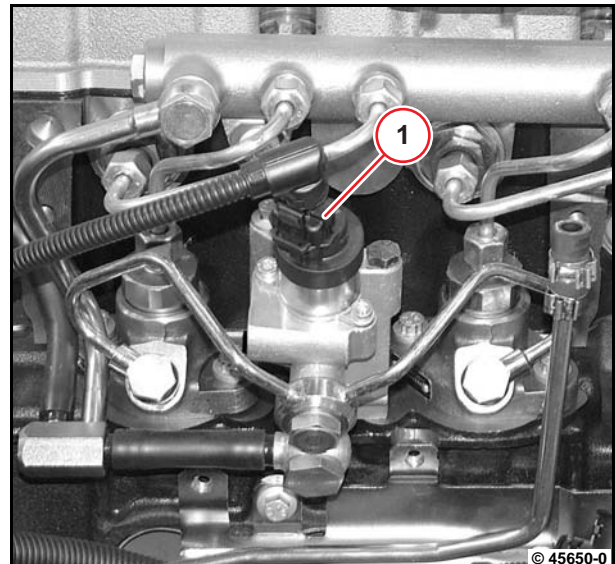


6

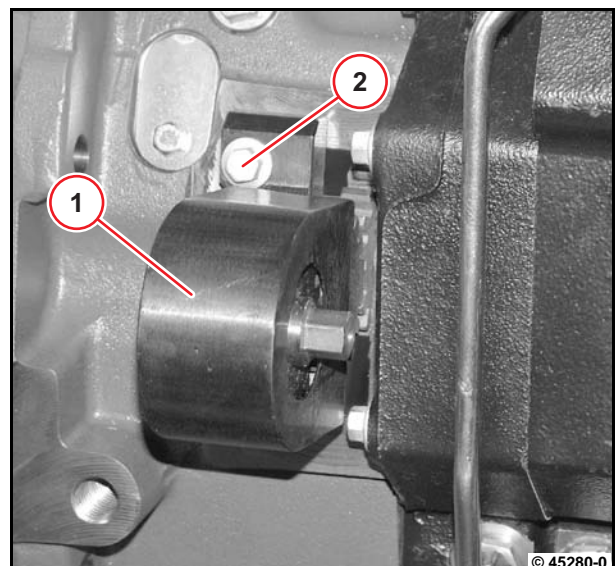
- Plug in the cable plug (1).



Ensure that the connection is perfect.



- Unscrew screw (2).
- Remove turning gear (1).



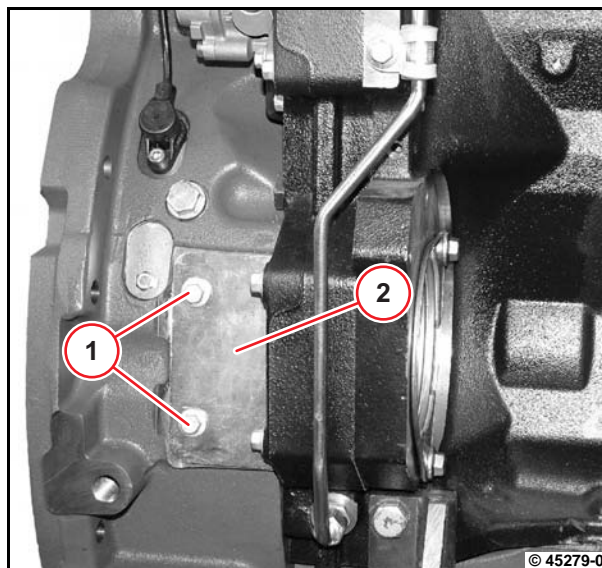
- Mount cover (2).
- Tighten screws (1).



A03 085



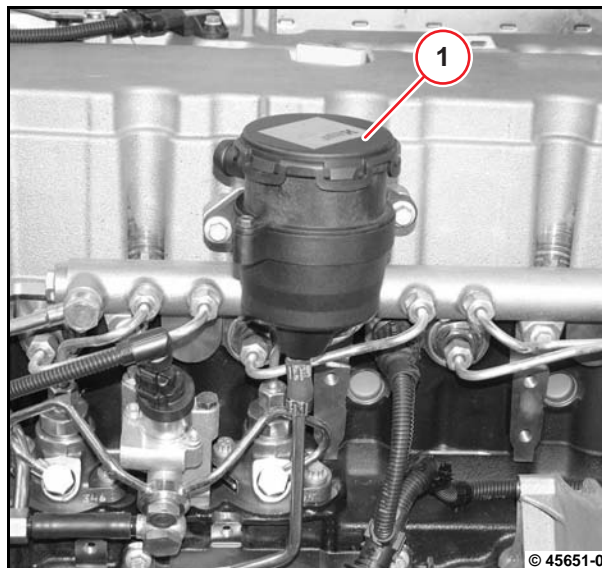
Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operation manual.



- Install crankcase breather (1).



W 03-01-11





## Removing and installing the rail



Commercial available tools

Special tools:

- Special wrench . . . . . 110500
- Plugs/caps . . . . . 170160



- Fitting compound  
DEUTZ AP1908



- [User notes](#)
- [W 03-01-11](#)



### Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



### Attention!

Pay attention to utmost cleanliness when working on the fuel system.

Clean the respective affected parts carefully. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean stoppers/caps.

Do not remove stoppers/caps until immediately before assembling.

Collect leaking operating substances in suitable vessels and dispose of according to regulations.

The relevant documentation of the vehicle/device manufacturer must be observed when emptying and filling the cooling system.

## Removing the rail



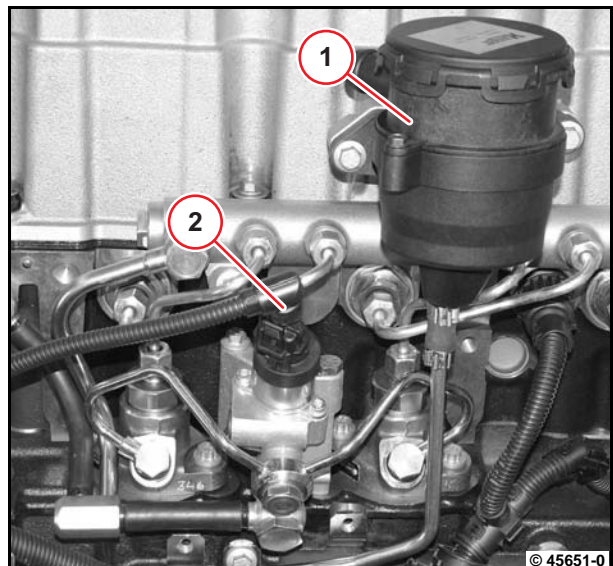
### Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

- Remove crankcase breather (1).

 [W 03-01-11](#)

- Unlock cable plug (2) and remove.

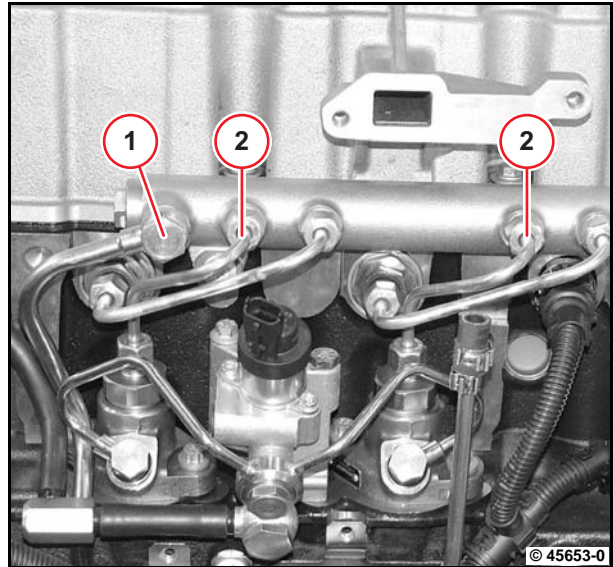


- Unscrew hollow screw (1).
- Remove fuel pipe and sealing rings.
- Remove high pressure pipes (2) with special wrench.

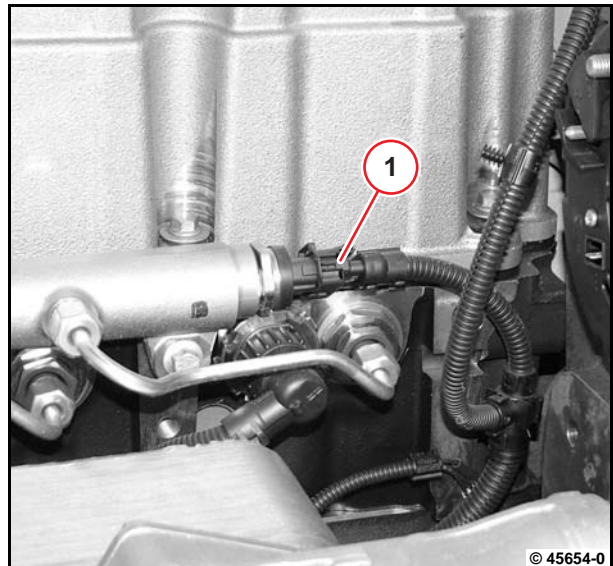


Support the pipe connection of the high pressure pump.

Collect draining fuel and dispose of according to regulations.



- Unlock cable plug (1) and remove.

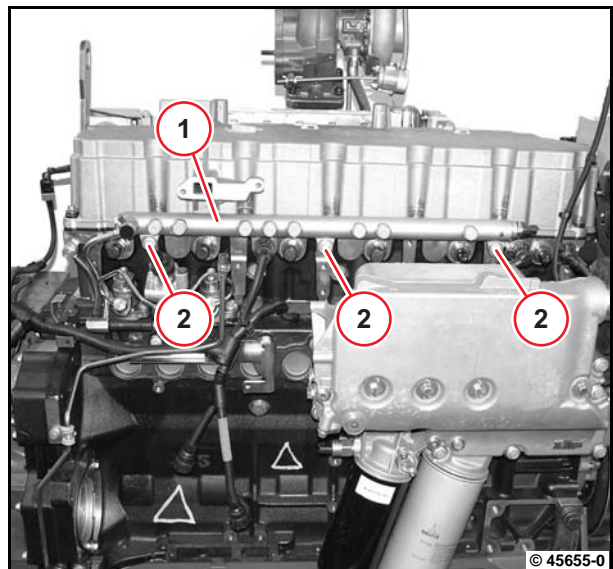


- Remove all injection pipes from the rail (1) and from the pressure pipe nozzles with a special wrench.

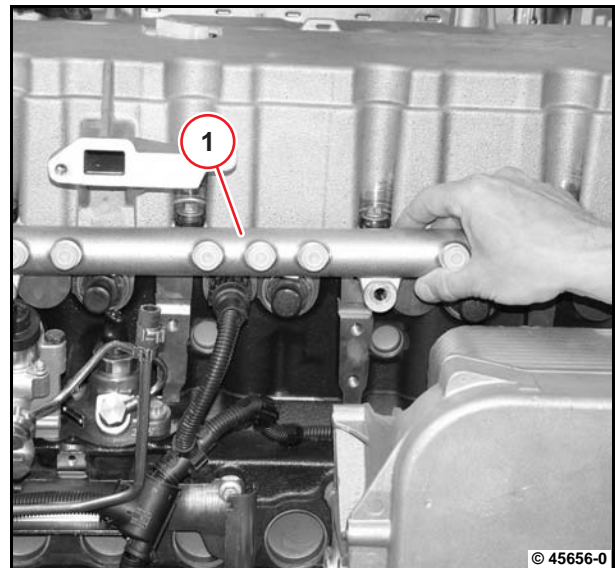


Collect draining fuel and dispose of according to regulations.

- Unscrew screws (2).



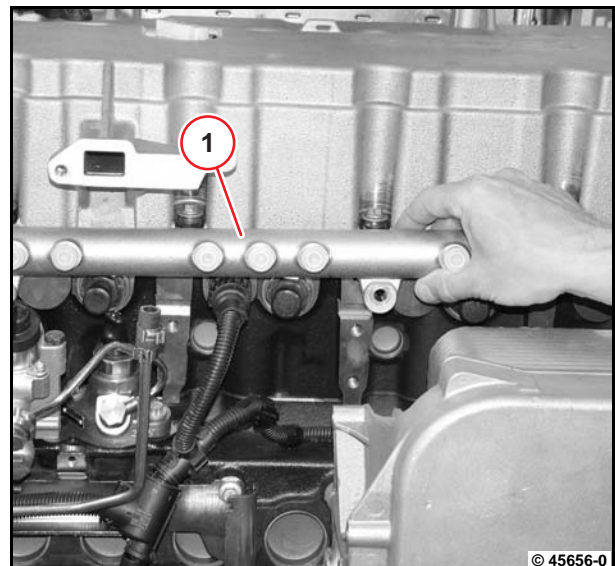
- Remove rail (1).
- Visually inspect the component.



6

### Mounting rail

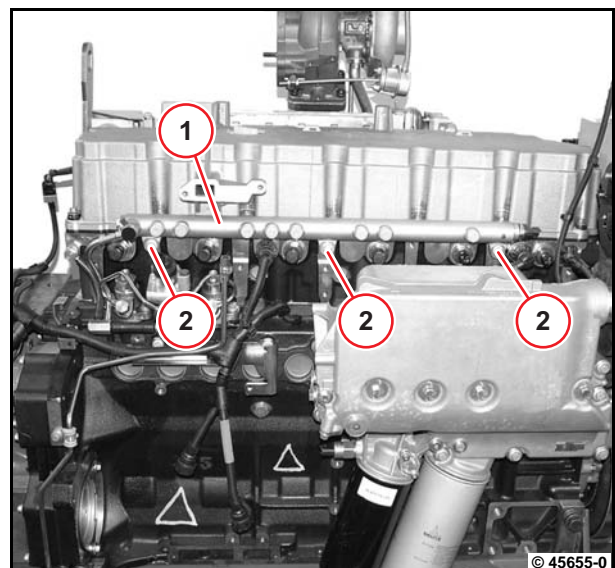
- Insert rail (1).



- Pre-assemble the rail (1) loosely with screws (2).



Do not tighten screws.







### Attention!

The injection lines must always be renewed after disassembly.

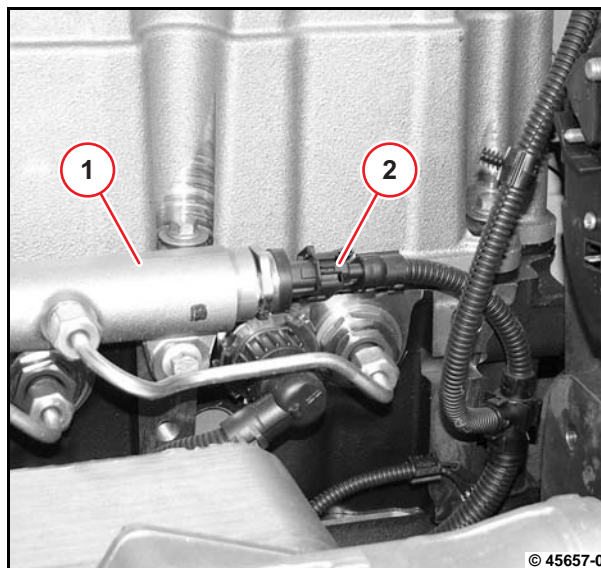
- Pre-assemble new injection pipes on the rail (1) and the pressure pipe nozzles.
- Check the injection pipes for perfect installation position.



### Attention!

Ensure absolute cleanliness of the connector!

- Plug in the cable plug (2).
- Ensure that the connection is perfect.



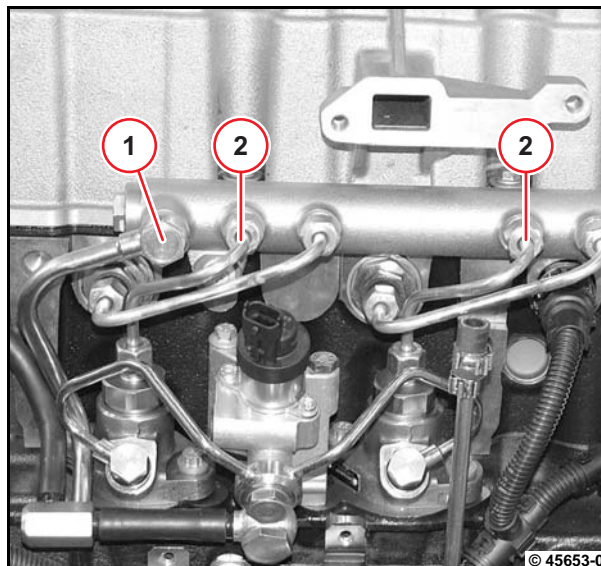
### Attention!

The high-pressure lines must always be renewed after disassembly.

- Pre-assemble new high pressure pipes (2) on the rail and on the high pressure pumps.
- Check the high-pressure line for perfect installation position.
- Mount fuel return pipe (1).



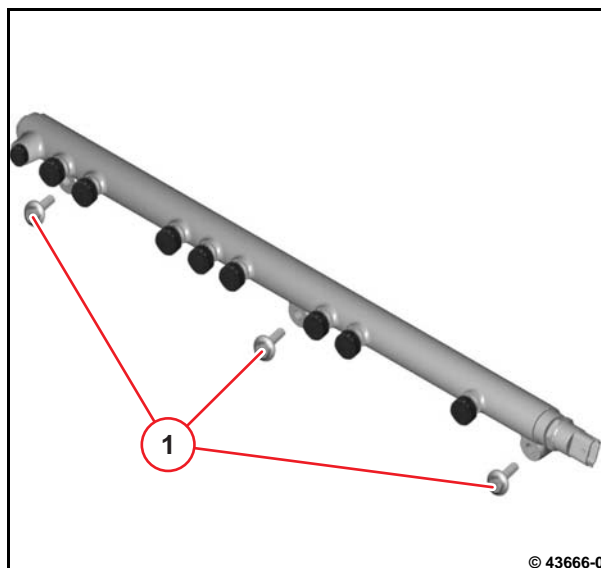
Use new sealing rings.



- Tighten screws (1).



A07 038



- Tighten all injection pipes on the rail (1) and on the pressure pipe nozzles with a special wrench.



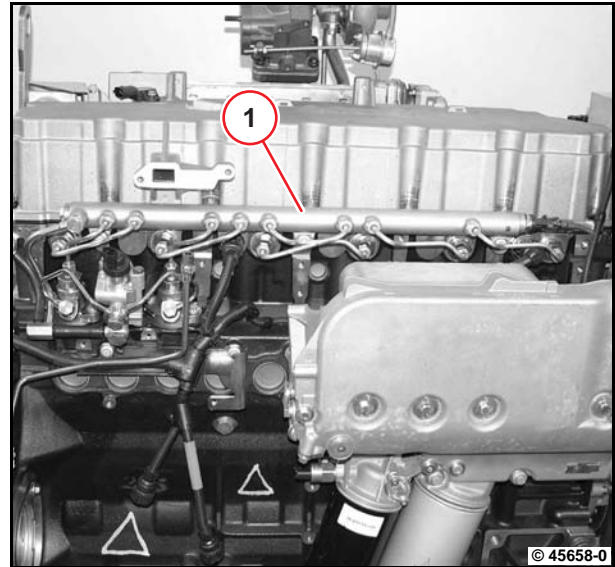
A07 003



### Attention!

Install injection pipes without tension!

- Check the injection pipes for perfect installation position.



6

- Tighten high pressure pipes (2) with special wrench.



A07 003



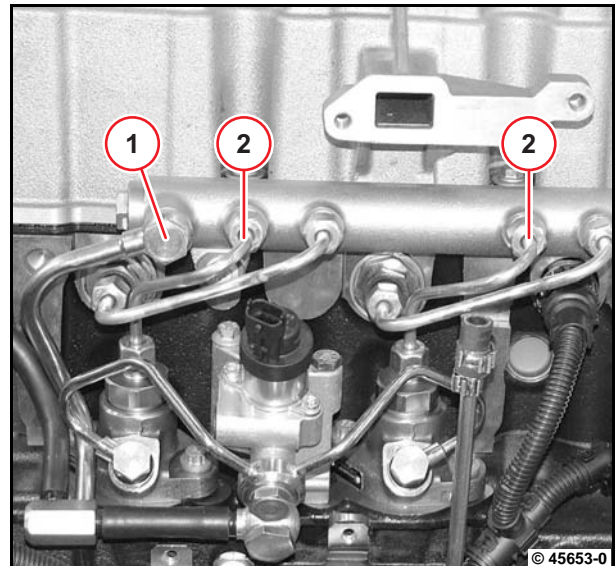
### Attention!

Install high pressure line without tension.

- Check the high-pressure line for perfect installation position.
- Tighten hollow screw (1).



A07 045



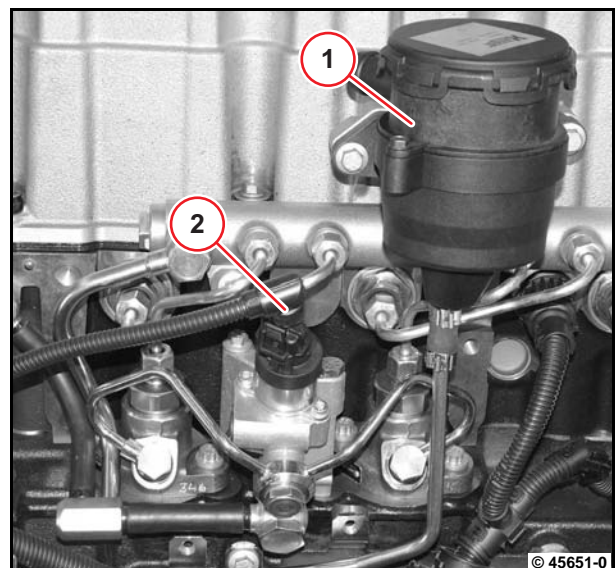
- Plug in the cable plug (2).
- Install crankcase breather (1).



W 03-01-11



Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operation manual.





## Removing and installing the injector



Commercial available tools:

- Hose clip pliers . . . . . 8011
- Assembly pliers . . . . . 8024
- Torx tool set . . . . . 8189

Special tools:

- Special wrench . . . . . 110500
- Lever tool . . . . . 110620
- Disassembly device . . . . . 110630
- Assembly case with  
assembly sleeves, guides  
and disassembly tool . . . . . 110900
- Extraction tool . . . . . 120680
- Slide hammer . . . . . 150800
- Plugs/caps . . . . . 170160



- Fitting compound  
DEUTZ AP1908



- [User notes](#)
- [W 03-01-11](#)



### Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



### Attention!

Ensure utmost cleanliness when working on the fuel system.  
Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.  
Observe the safety regulations and national specifications for handling fuels.  
Close all connections immediately after opening with new, clean plugs/caps.  
Do not remove plugs/caps until immediately before assembling.  
Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

## Remove injector



The following work procedure describes the removal and installation of an injector.

Proceed in the same way to remove further injectors.

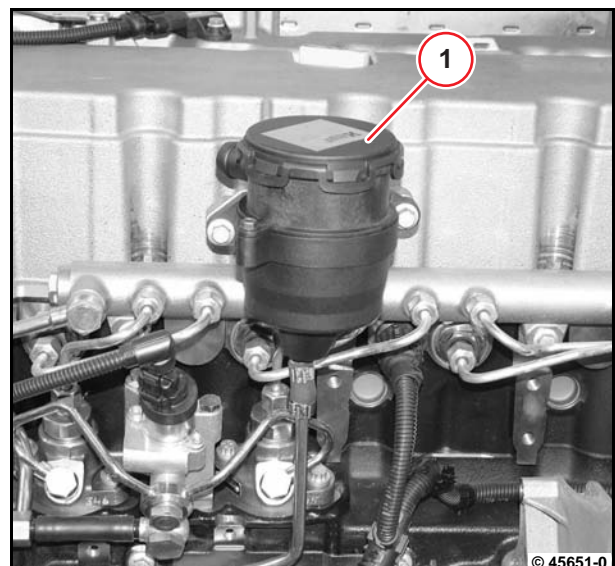


### Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

- Remove crankcase breather (1).

 [W 03-01-11](#)

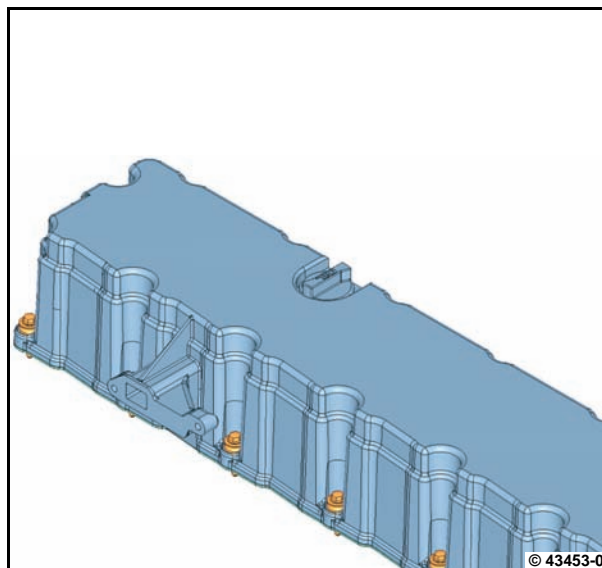




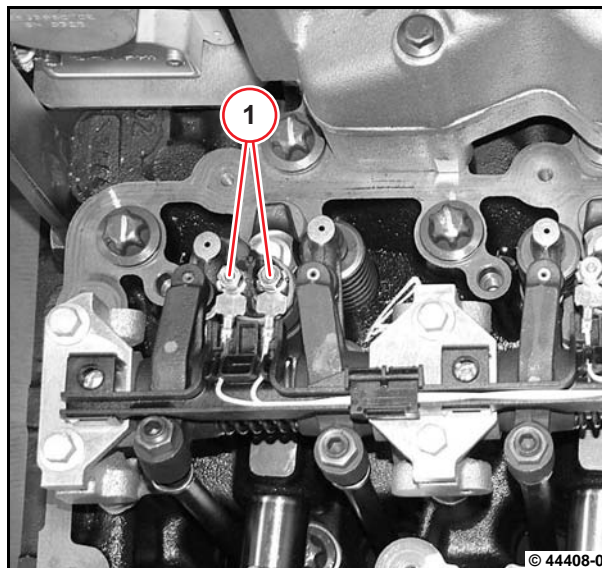
- Remove the cylinder head hood.



Gasket and screws are captively locked on the cylinder head hood.



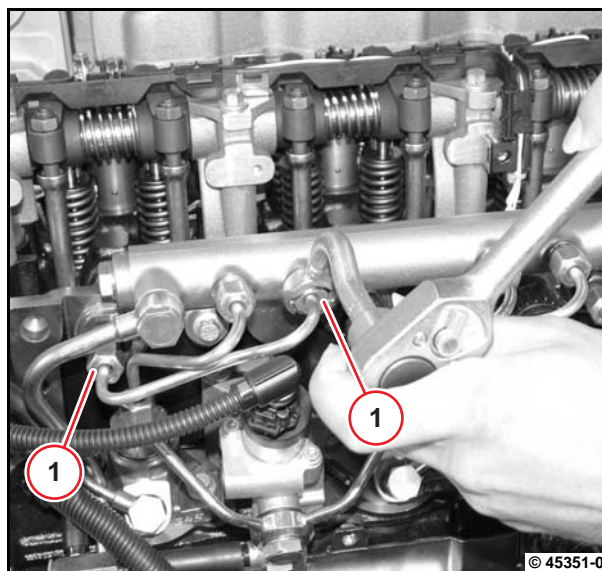
- Unscrew nuts (1).
- Remove cable from injector.



- Unscrew lock nuts (1) with special wrench.
- Remove injection line.



Collect draining fuel and dispose of according to regulations.



- Unscrew lock nuts (1) with special wrench.

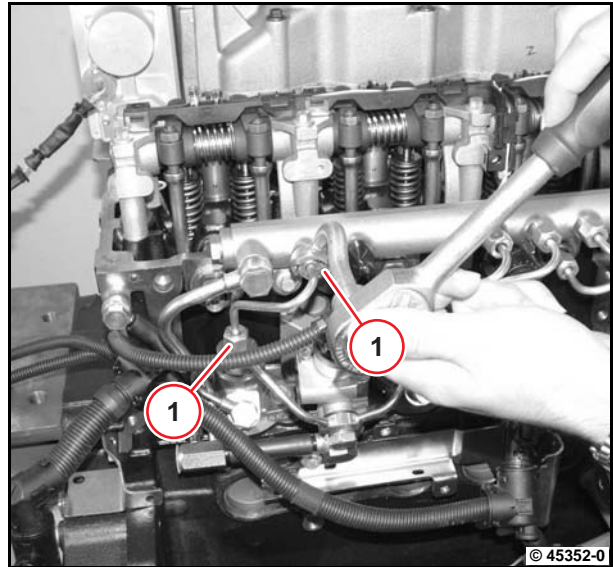


Support the pipe connection of the high pressure pump.

- Remove the high pressure pipe.

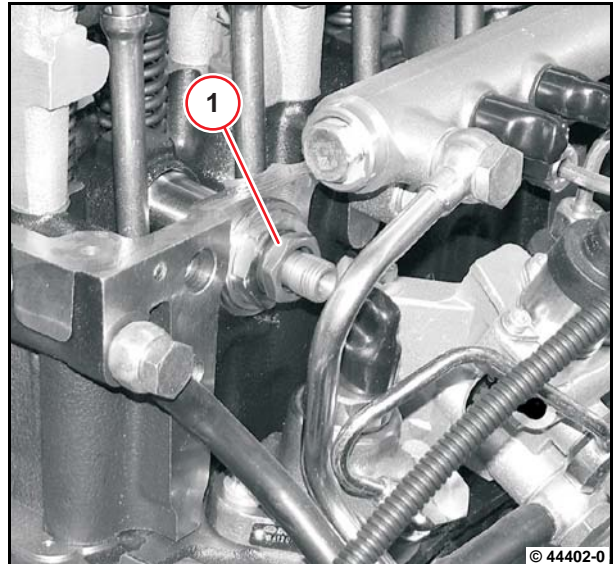


Collect draining fuel and dispose of according to regulations.

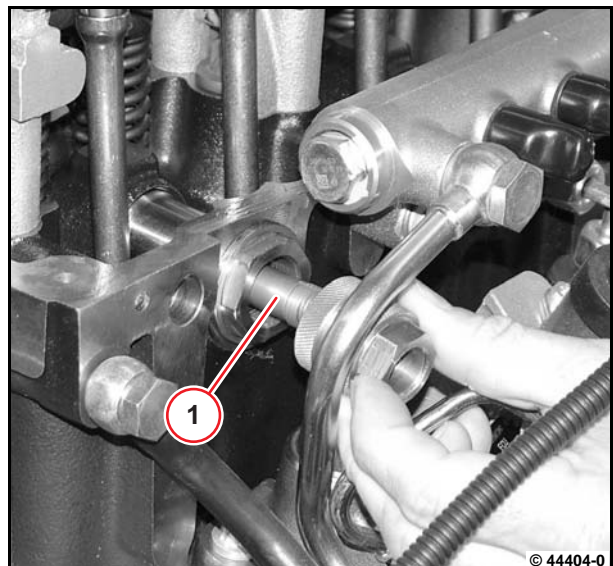


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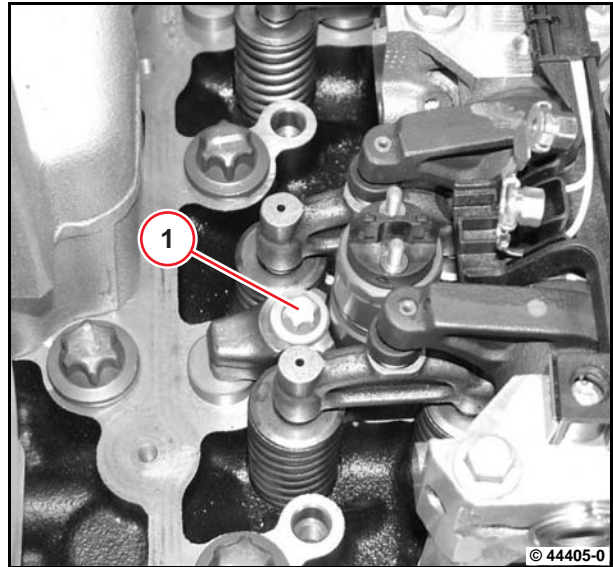
- Unscrew union screw (1).



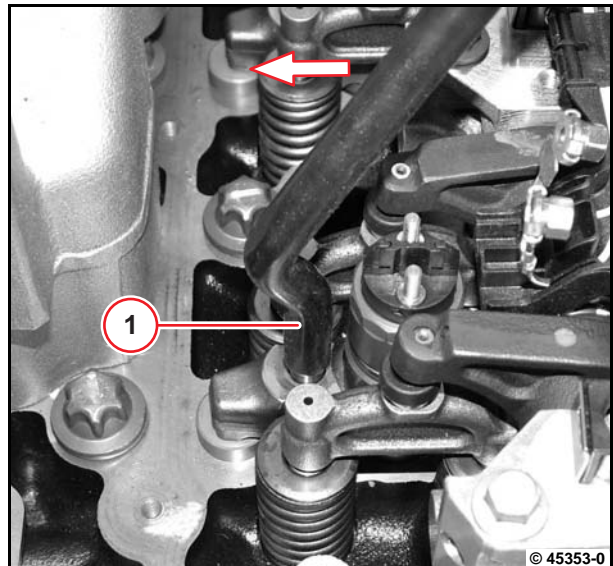
- Remove pressure pipe nozzles (1) with disassembly device 110630.



- Unscrew screw (1).



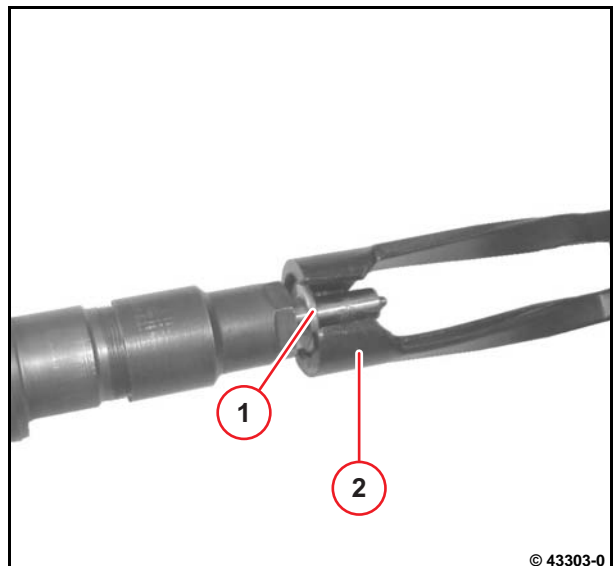
- Insert lever tool (1) in the clamping claw.
- Loosen the injector by moving the lever in the direction of the arrow.
- Remove injector and clamping claw.



**Attention!**

Do not brush off the nozzle tip of the injector.  
Do not damage the nozzle tip of the injector when removing the sealing ring (1).

- Grip a tight sealing ring (1) with the assembly pliers (2) and pull off, turning slightly.



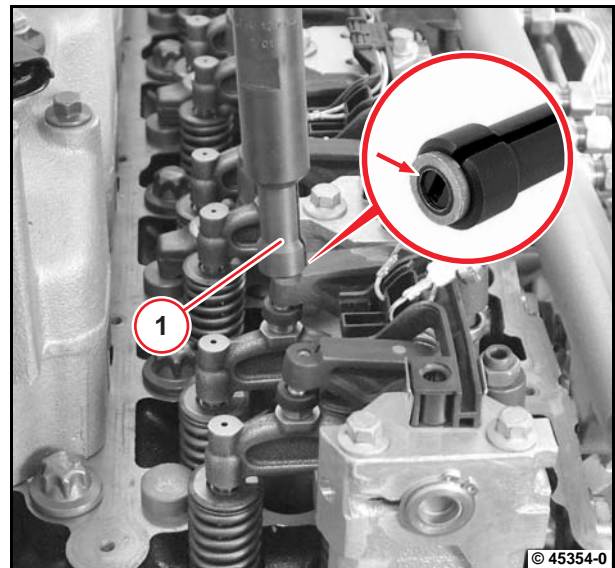


## Removing a tightly fixed sealing ring from the cylinder head

- Insert extraction device (1).



The holders (arrow) must sit in the bore of the sealing ring.



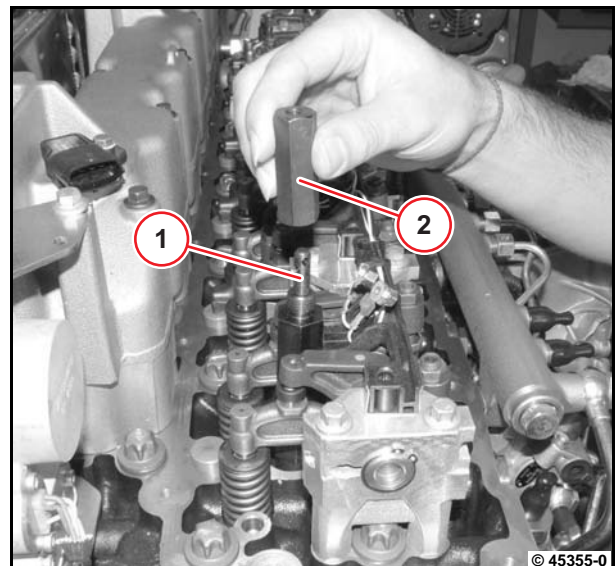
6

- Turn in the spindle (1) until the sealing ring is fixed to the extraction device.

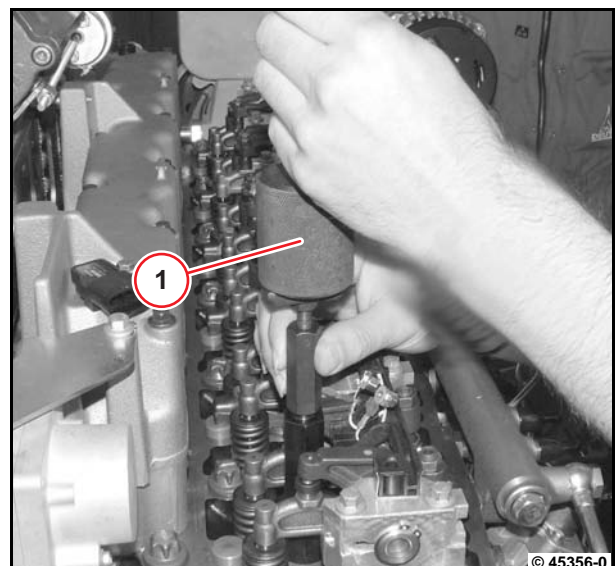


Hold puller on hexagon.

- Install adapter (2) on disassembly device.



- Install slide hammer (1) on disassembly device.
- Remove tight sealing ring.

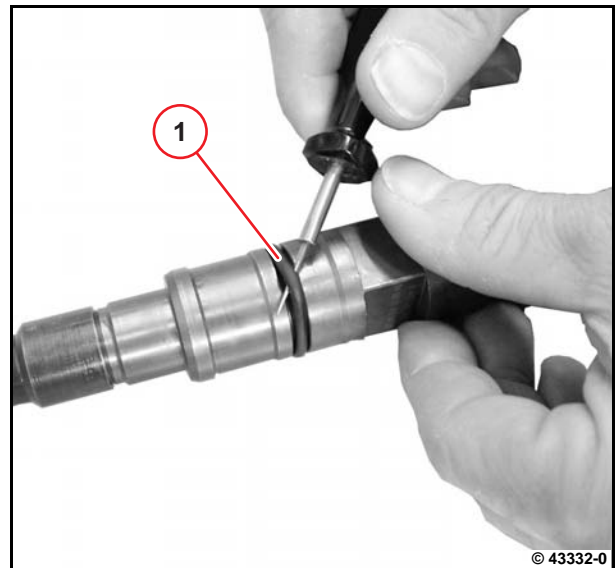


- Remove the round sealing ring (1) carefully from the injector with the disassembly tool.



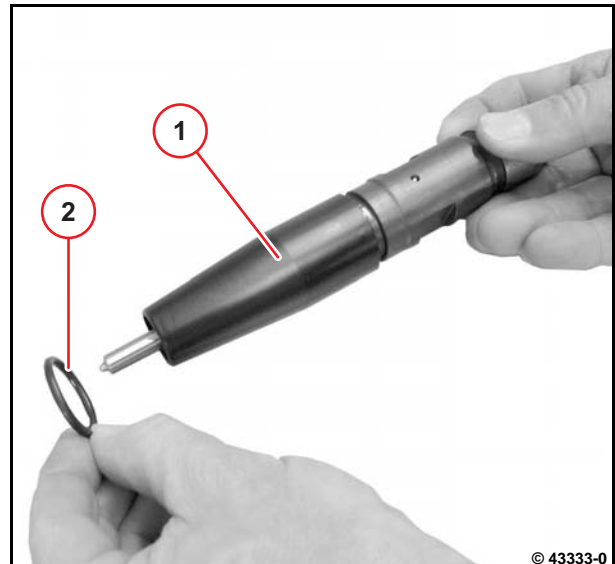
**Attention!**

Do not damage the injector.

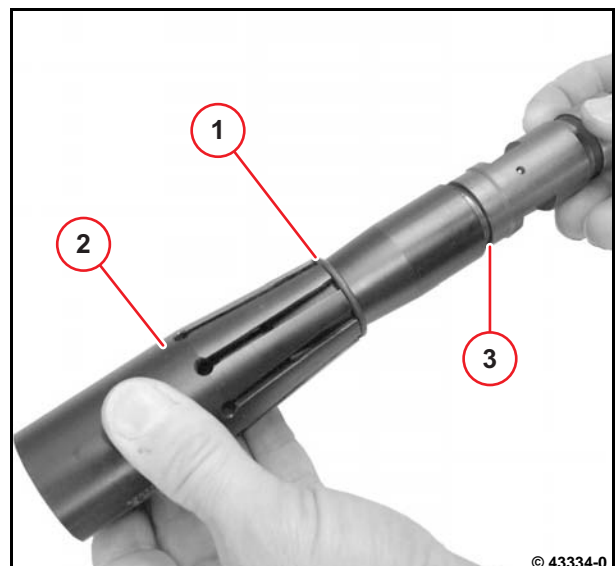



**Installing the injector**

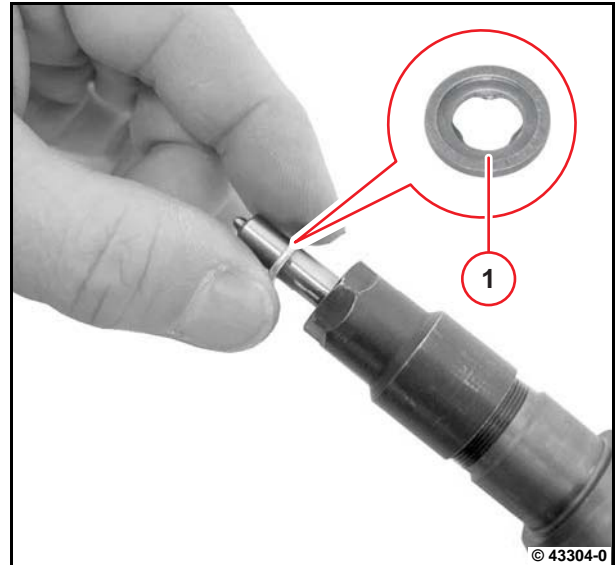
- Push assembly guide (1) onto injector.
- Push the new O-ring (2) onto the assembly guide.




- Push the O-ring (1) with assembly sleeve (2) up to the groove (3).



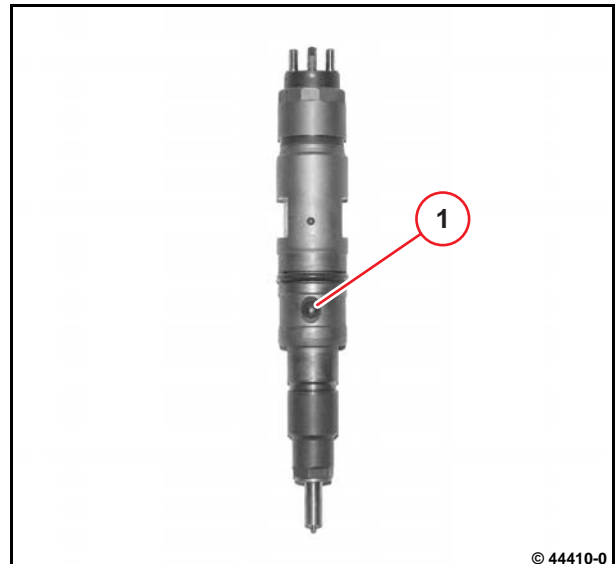
- Mount new sealing ring (1) on injector.
-  Note installation position of the sealing ring.  
The taper (1) points to the injector.



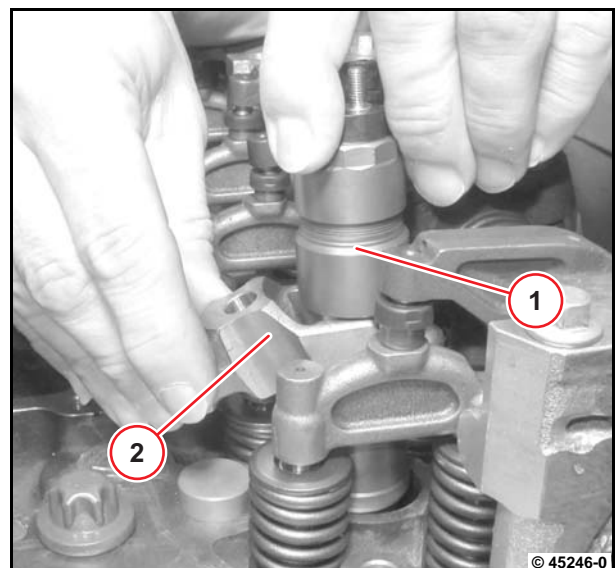
6

-  **Attention!**  
Before installing the injector, combustion residue must be cleaned carefully from the bore on the cylinder head.  
Suck off dirt particles.

- Position the injector so that the mounting bore (1) is facing the operating side.
- Lightly oil O-ring.



- Insert the injector (1) with clamping claw (2) carefully in the cylinder head.



- Tighten screw (1).

– **Pre-clamping value:**



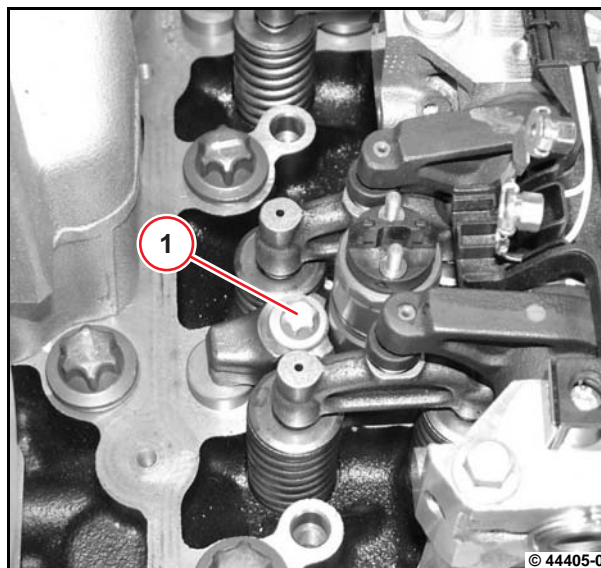
A07 001

- Relieve the load on the injector by loosening the screw (1).



No axial force may be exerted on the injector.

Ensure that the installation location is free from faults.



### Attention!

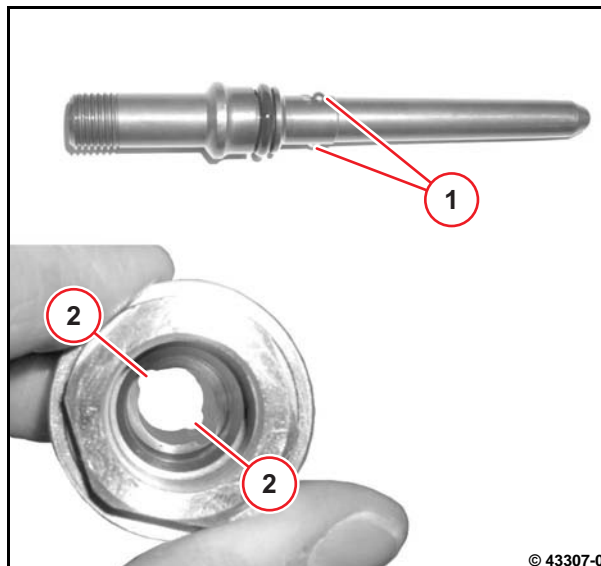
The pressure pipe nozzle must always be renewed.

- Lightly oil O-ring.



Position the pressure pipe nozzle and press it into the sleeve so that the balls (1) of the anti-rotation lock fit perfectly in the grooves (2) in the sleeve.

- Insert the pressure pipe nozzle in the cylinder head with a new round sealing ring.

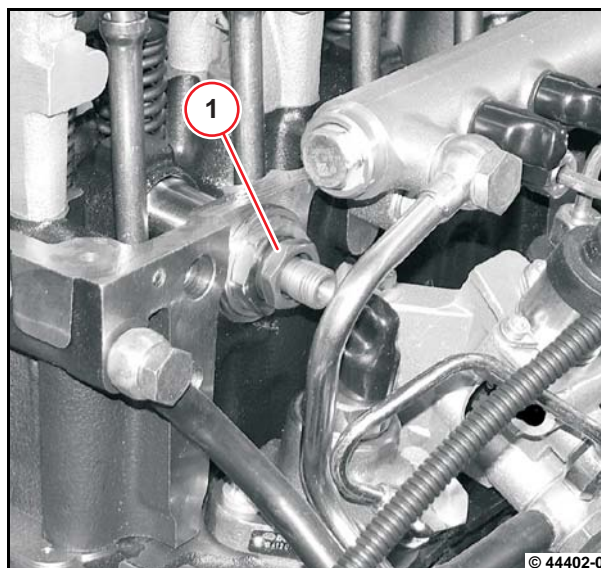


- Pre-assemble the union screw (1).

– **Pre-clamping value:**



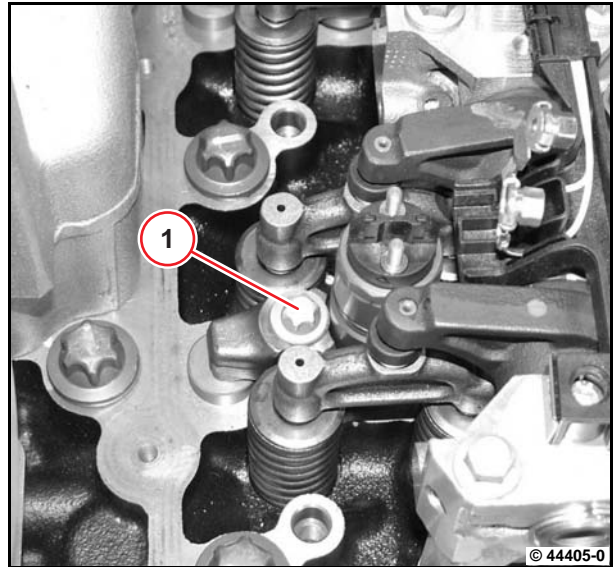
A07 036





- Tighten screw (1).
- Post-clamping value:

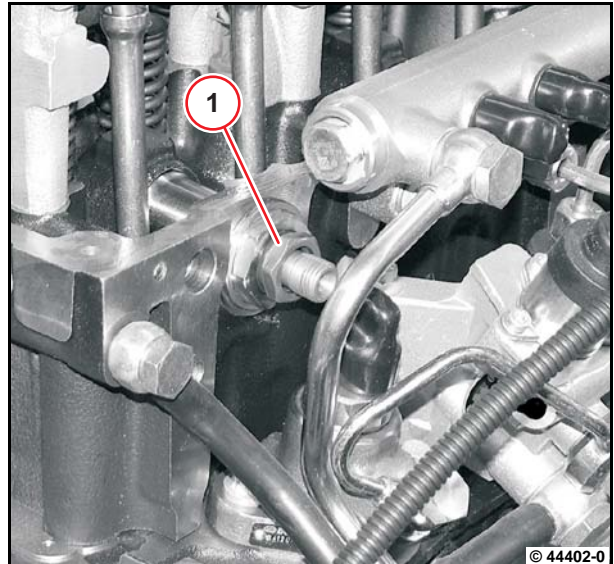
 A07 001



6

- Tighten pressure pipe nozzle with union screw (1).
- Post-clamping value:

 A07 036



**Attention!**

The high-pressure line must always be renewed after disassembly.

- Install new high pressure pipe (1).
- Tighten union nuts with special wrench.

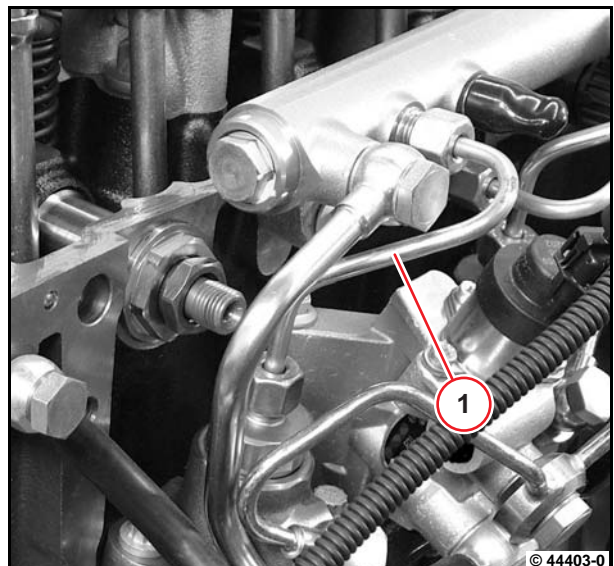
 A07 003



**Attention!**

Install high pressure line without tension.

- Check the high-pressure line for perfect installation position.





#### Attention!

The high pressure pipe must always be renewed after disassembly.

- Install new high pressure pipe (1).
- Tighten union nuts with special wrench.



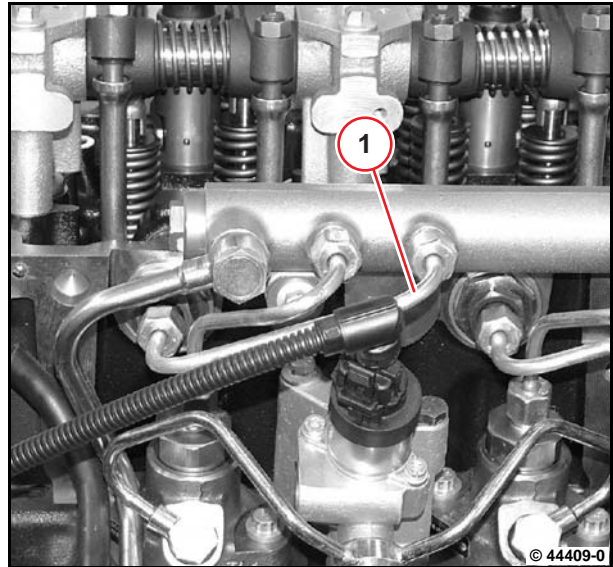
A07 003



#### Attention!

Install injection line without tension.

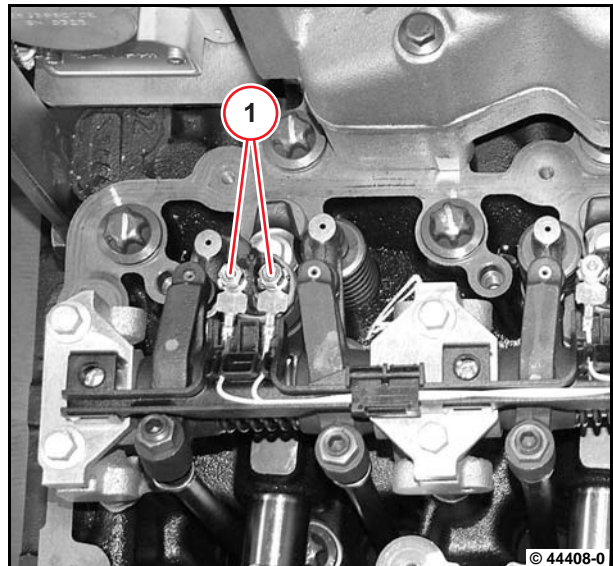
- Check the injection line for perfect installation position.



- Mount cable on injector.
- Tighten nuts (1).



A13 051



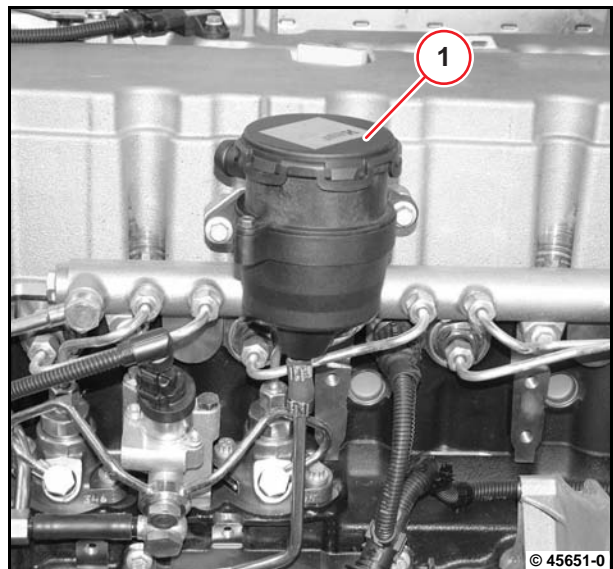
- Install crankcase breather (1).



W 03-01-11



Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operation manual.



## Removing and installing the pressure limiting valve



Commercial available tools

Special tools:

- Disassembly tool . . . . . 110901
- Plugs/caps . . . . . 170160



- Assembly grease . . . . . 01016496



– User notes



### Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



### Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

No foreign bodies may get into the rail.

Ensure utmost cleanliness. Especially on the thread and the sealing surface of the rail.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean plugs/caps.

Do not remove plugs/caps until immediately before assembling.

## Removing the pressure limiting valve



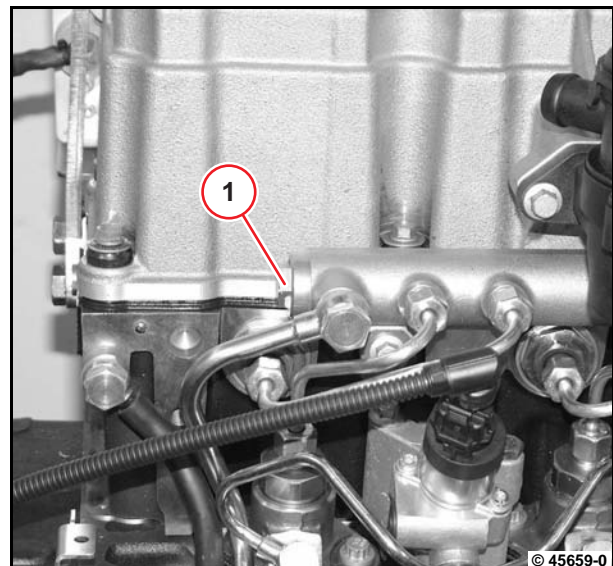
### Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

- Unscrew pressure limiting valve (1).

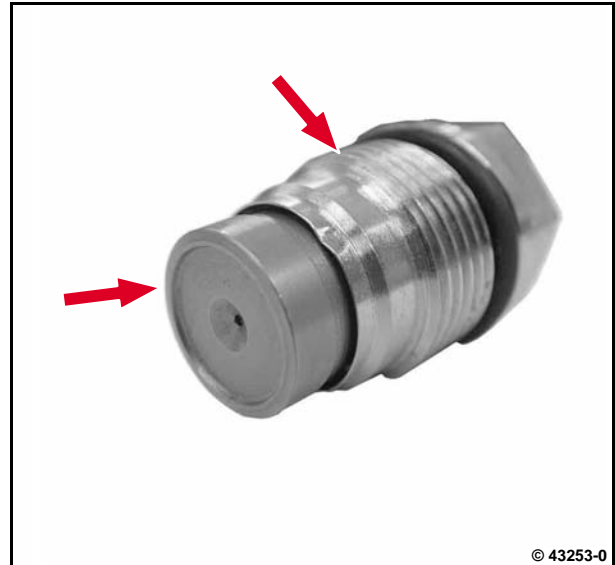


Collect draining fuel and dispose of according to regulations.

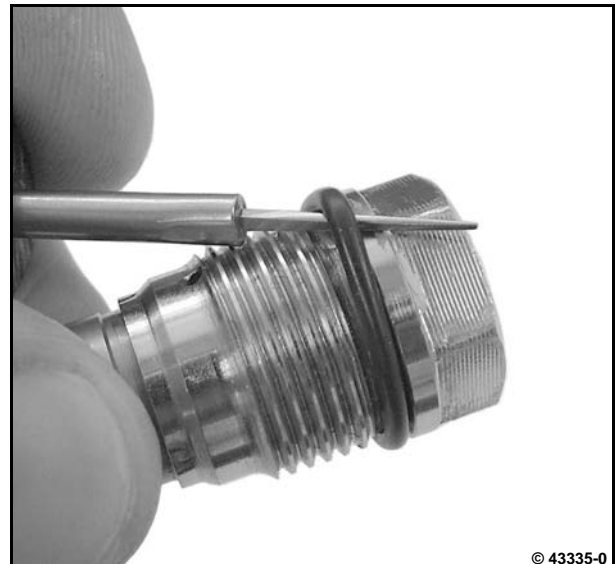




- Visually check the thread and the sealing edge of the pressure limiting valve.



- Remove the O-ring with the disassembly tool.



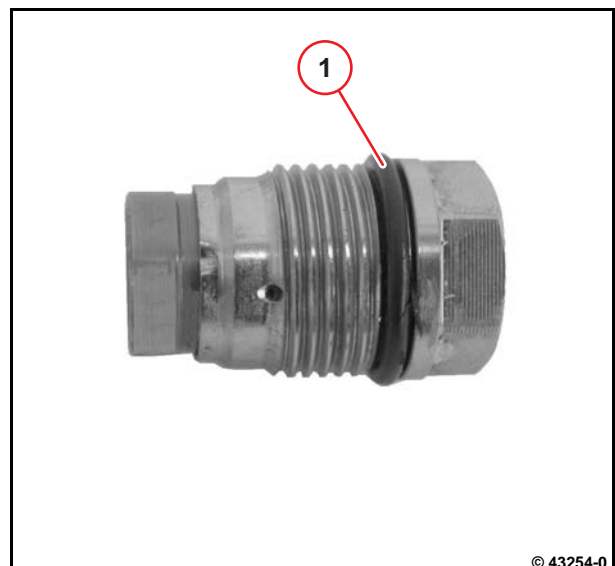
### Installing the pressure limiting valve



#### Attention!

No foreign bodies may get into the rail. Ensure utmost cleanliness. Especially on the thread and the sealing surface of the rail.

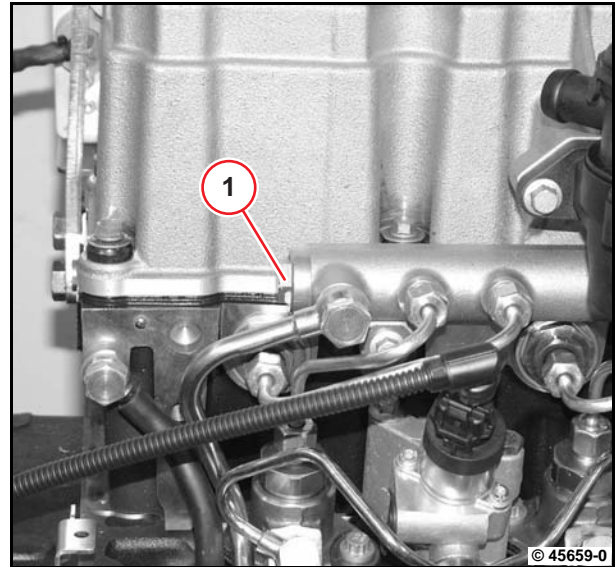
- Mount new O-ring (1).
- Lightly coat the thread and sealing edge of the pressure limiting valve with assembly grease.



- Screw in pressure limiting valve (1).
- Tighten pressure limiting valve.

**A07 039**

Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operating instructions.





## Removing and installing the rail pressure sensor



Commercial available tools

Special tools:

- Long socket wrench insert . . . . . 110700
- Plugs/caps . . . . . 170160



- Assembly grease . . . . . 01016496



– User notes



### Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



### Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

No foreign bodies may get into the rail.

Ensure utmost cleanliness. Especially on the thread and the sealing surface of the rail.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean plugs/caps.

Do not remove plugs/caps until immediately before assembling.

## Removing the rail pressure sensor



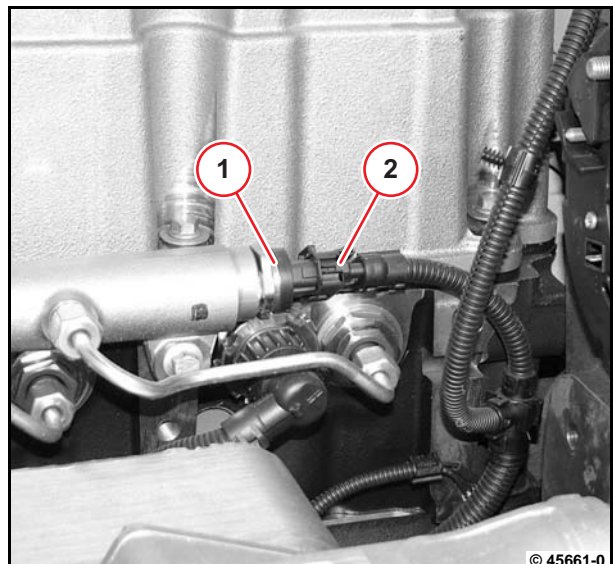
### Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

- Unlock cable plug (2) and remove.
- Unscrew the rail pressure sensor (1) with the socket wrench.



Collect draining fuel and dispose of according to regulations.

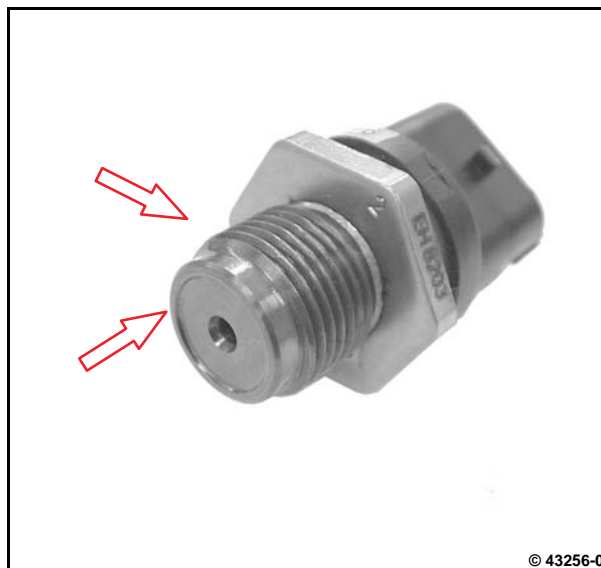




**Attention!**

Do not touch the pin contacts of the rail pressure sensor with your hands to avoid electrostatic discharging.  
Ensure absolute cleanliness of the connector.

- Visually check the thread and the sealing edge (arrows) of the rail pressure sensor.



**Installing the rail pressure sensor**



**Attention!**

No foreign bodies may get into the rail.  
Ensure utmost cleanliness. Especially on the thread and the sealing surface of the rail.

- Coat the thread and sealing edge of the rail pressure sensor lightly with assembly grease.



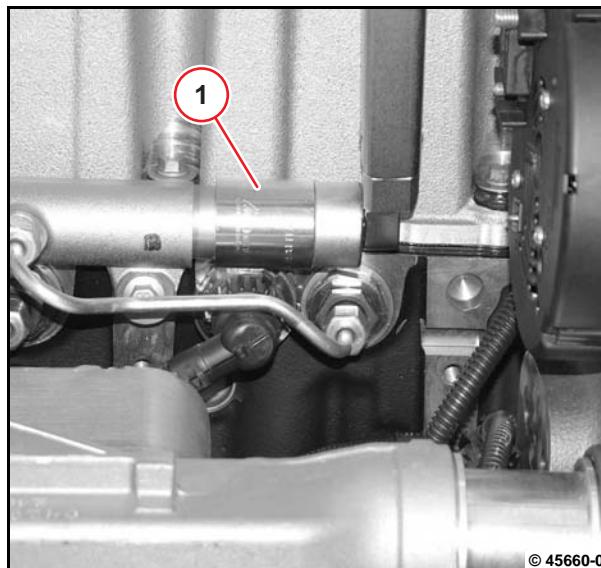
**Attention!**

Only tighten the rail pressure sensor with the hexagon.

- Screw in the rail pressure sensor.
- Tighten rail pressure sensor with socket wrench insert (1).



A07 040



**Attention!**

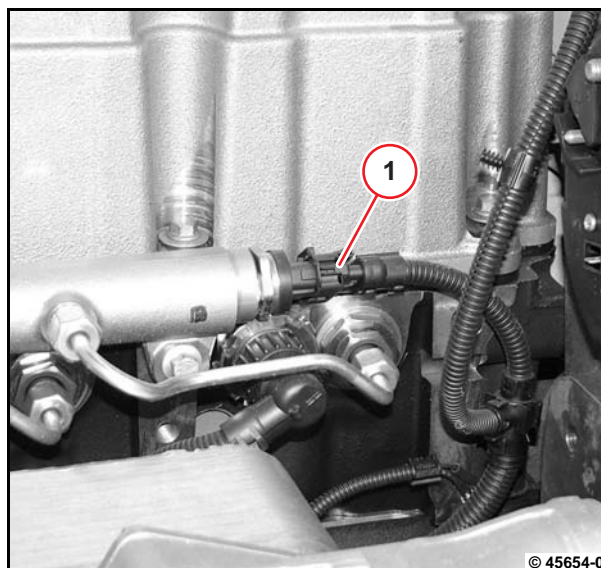
Ensure absolute cleanliness of the connector!

- Plug in the cable plug (1).



Ensure that the connection is perfect.

Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operation manual.



## Removing and installing the fuel pressure sensor



Commercial available tools

Special tools:

- Long socket wrench insert . . . . . 110700
- Plugs/caps . . . . . 170160



– [User notes](#)



### Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



### Attention!

Ensure utmost cleanliness when working on the fuel system.  
Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.  
Observe the safety regulations and national specifications for handling fuels.  
Close all connections immediately after opening with new, clean plugs/caps.  
Do not remove plugs/caps until immediately before assembling.  
Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

## Removing the fuel pressure sensor



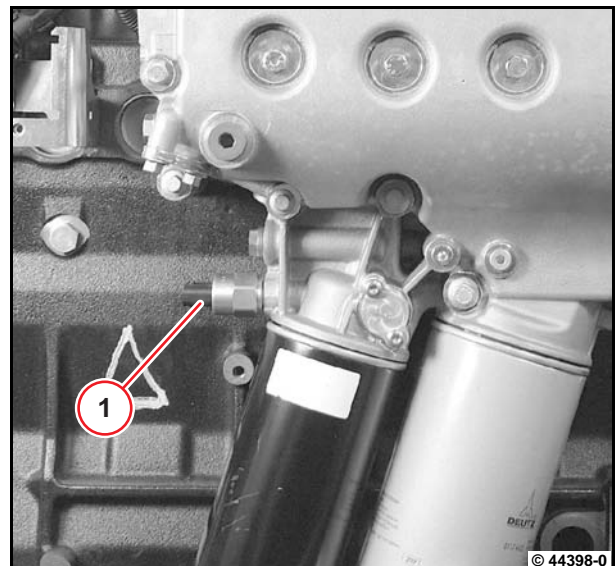
### Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

- Unlock cable plug.
- Pull out cable plug.
- Unscrew fuel pressure sensor (1) with the socket wrench.



Collect draining fuel and dispose of according to regulations.



### Installing the fuel pressure sensor

- Mount new O-ring.
- Install fuel pressure sensor (1) with the socket wrench.



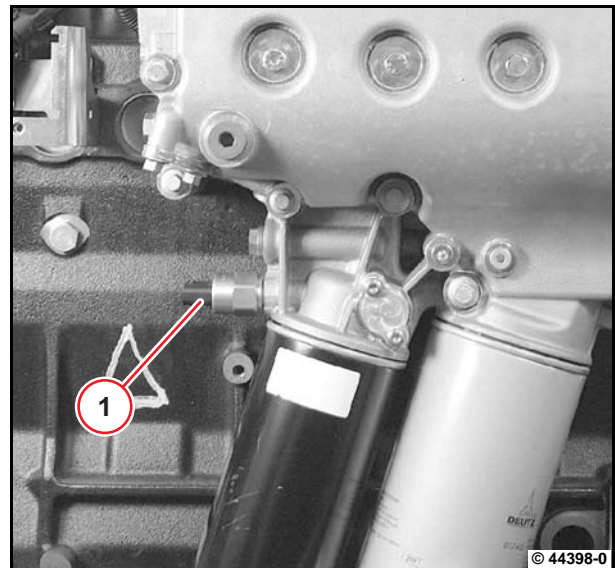
**A07 090**

- Plug on cable plug.



Ensure that the connection is perfect.

Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operation manual.





## Removing and installing the lubricating oil pan (heavy duty version)



Commercial available tools:  
– 4 pin bolts M8x70



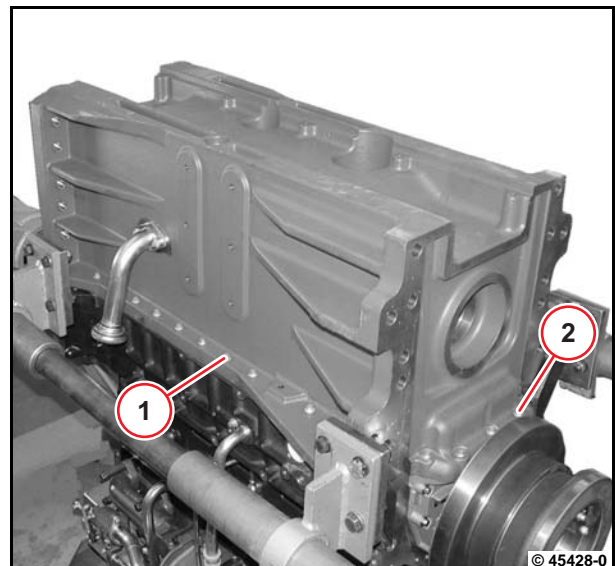
– Packing compound  
DEUTZ DW 74




Collect leaking operating substances in suitable vessels and dispose of according to regulations.  
The engine oil should be filled according to the operating manual.

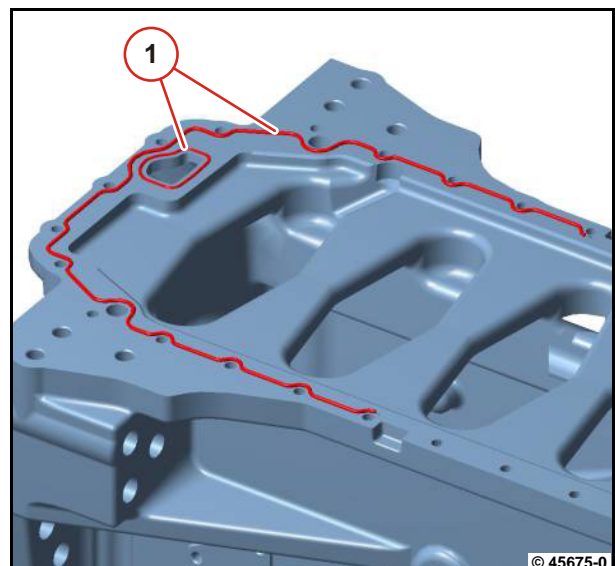
### Removing the lubricating oil pan

- Remove oil dipstick.
- Remove screw cap.
- Drain, collect and dispose of engine oil according to regulations.
- Turn the engine on the assembly block.
- Unscrew all screws (1).
- Unscrew all screws (2).
- Lift the lubricating oil pan with the workshop crane.

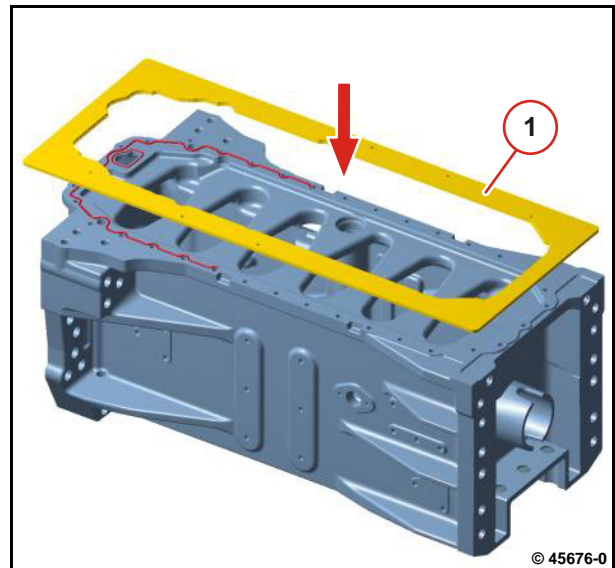


### Installing the lubricating oil pan

- Clean sealing surfaces.
-  The sealing surfaces must be dry and free from grease and dirt.
- Mount new gaskets (1).



- Mount template (1).



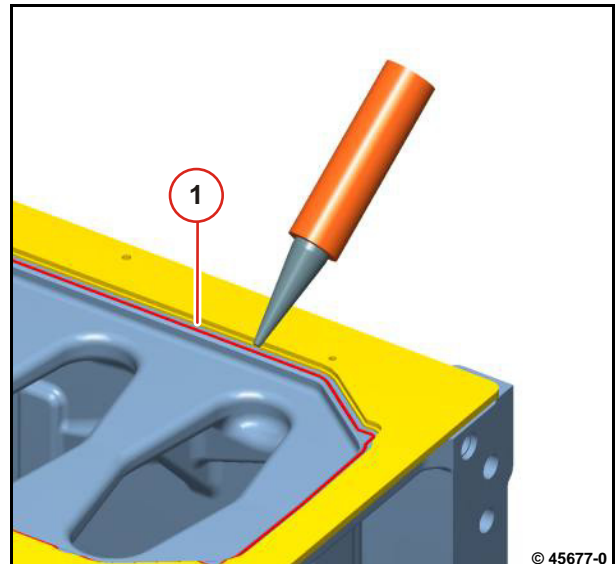
- Apply sealant evenly.



Apply sealant along the template contour (1) evenly.

Apply the sealant in an even stream (about 3.5 mm thick).

- Remove template (1).



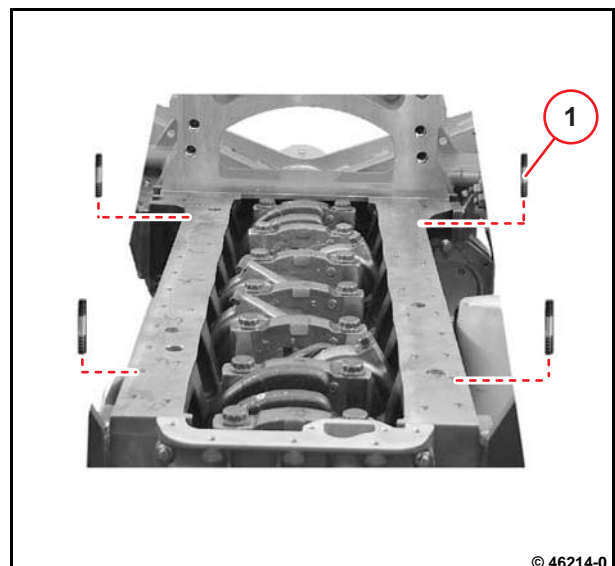
- To align the lubricating oil pan, screw four pin bolts (1) diagonally opposed into the crankcase.
- Lower the lubricating oil pan down carefully onto the crankcase.
- Align the lubricating oil pan in the appropriate installation position with the pin bolts.
- Mount lubricating oil pan.





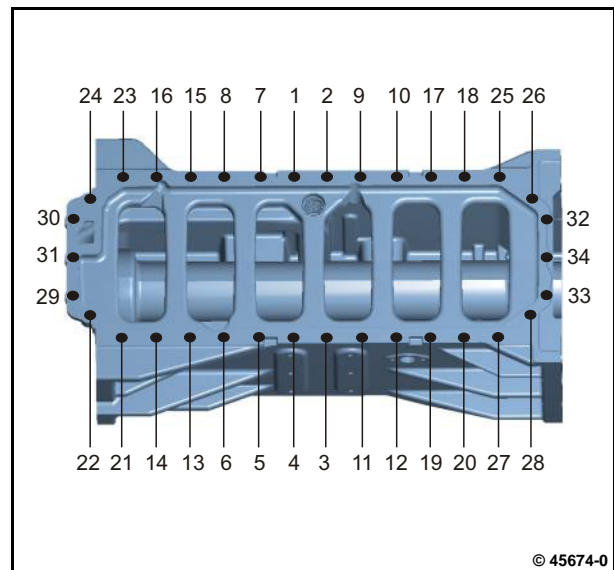
**Attention!**

Do not move the lubricating oil pan any more.  
Observe the drying time for the packing compound.

- Unscrew the pin bolts.



- Fasten all screws.
- Tighten the screws according to the tightening sequence.
- 
**A03 030**
- Tighten screw plug.
- 
**A03 031**
- Insert oil dipstick.
- Fill engine oil according to operating instructions.





## Removing and installing the oil cooler



Commercial available tools

Special tools:

– Disassembly tool . . . . . 110901



– Fitting compound  
DEUTZ AP1908



– W 08-08-03



Collect leaking operating substances in suitable vessels and dispose of according to regulations.

The appropriate operating manual should be observed for emptying and filling the engine.

### Removing the oil cooler

- Remove oil cooler housing.

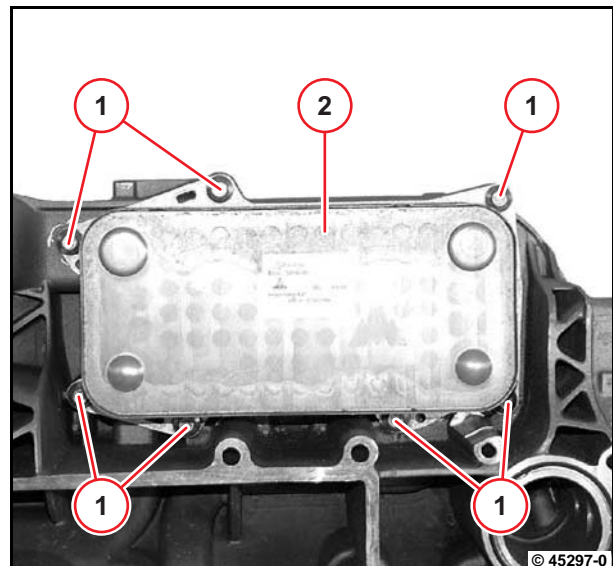


W 08-08-03

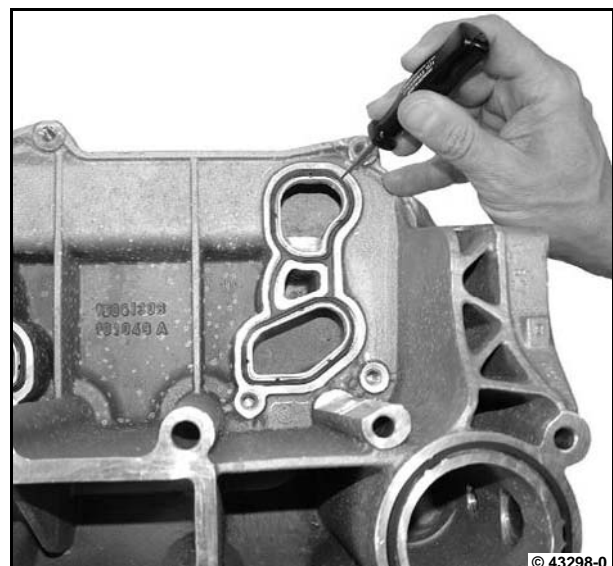
- Unscrew screws (1).
- Remove oil cooler (2).



Collect draining engine oil and dispose of according to regulations.

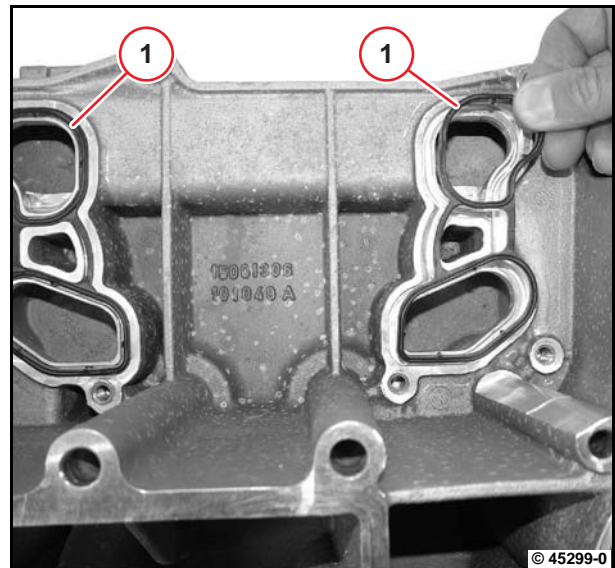


- Remove shaped sealing rings with disassembly tool.



### Installing the oil cooler

- Clean sealing surfaces.
- Insert shaped sealing rings (1).
- Coat the shaped sealing rings with mounting compound .



- Mount oil cooler (2).
- Tighten screws (1).

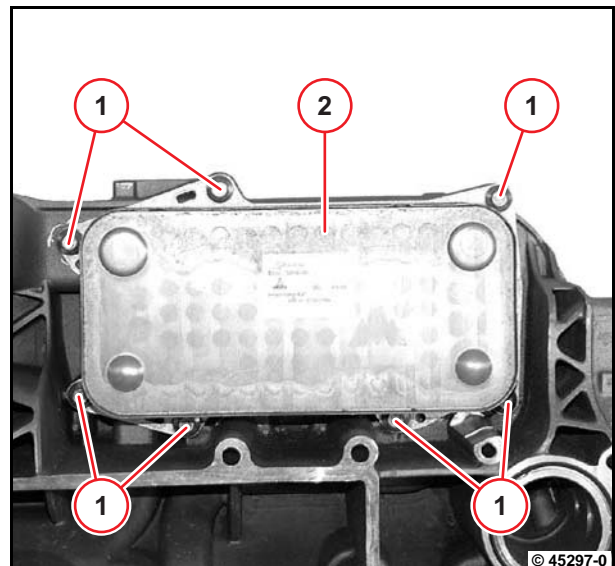


A08 052

- Install oil cooler housing.



W 08-08-03



## Removing and installing the oil cooler housing



Commercial available tools

Special tools:

– Disassembly tool. . . . . 110901



– Fitting compound  
DEUTZ AP1908



### Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



### Attention!

Pay attention to utmost cleanliness when working on the fuel system.

Clean the respective affected parts carefully. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean stoppers/caps.

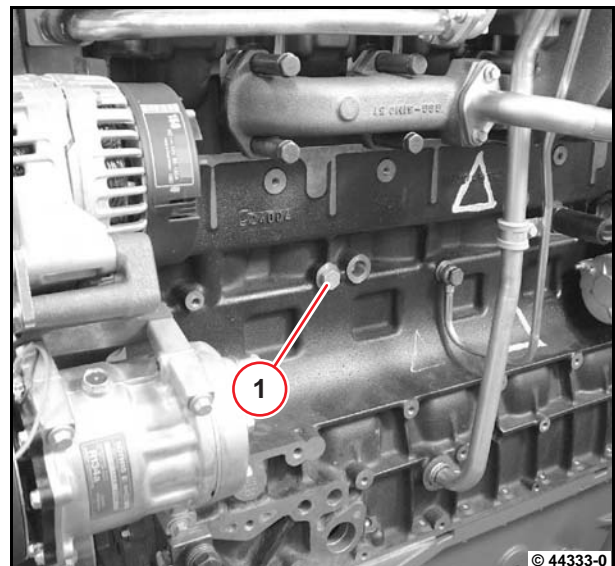
Do not remove stoppers/caps until immediately before assembling.

Collect leaking operating substances in suitable vessels and dispose of according to regulations.

The relevant documentation of the vehicle/device manufacturer must be observed when emptying and filling the cooling system.

## Removing the oil cooler housing

- Unscrew locking screw (1).
- Drain, collect and dispose of coolant according to regulations.
- Drain, collect and dispose of engine oil according to regulations.

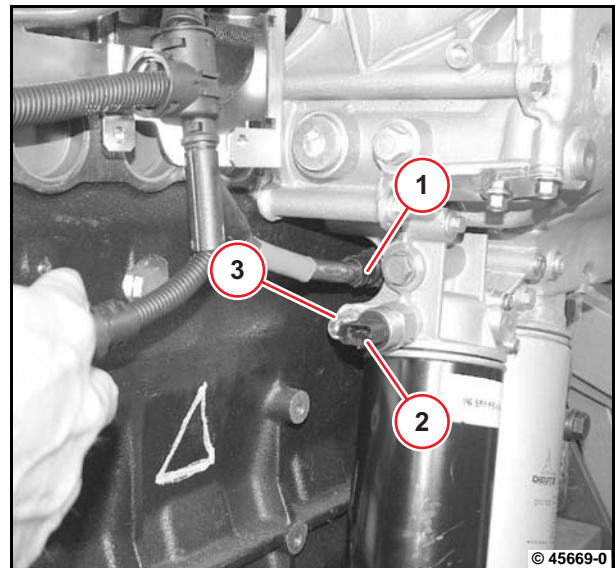




- Unscrew cable plug (1) from oil pressure switch.
- Unlock cable plug (2) and remove.
- Unscrew fuel pipe (3).



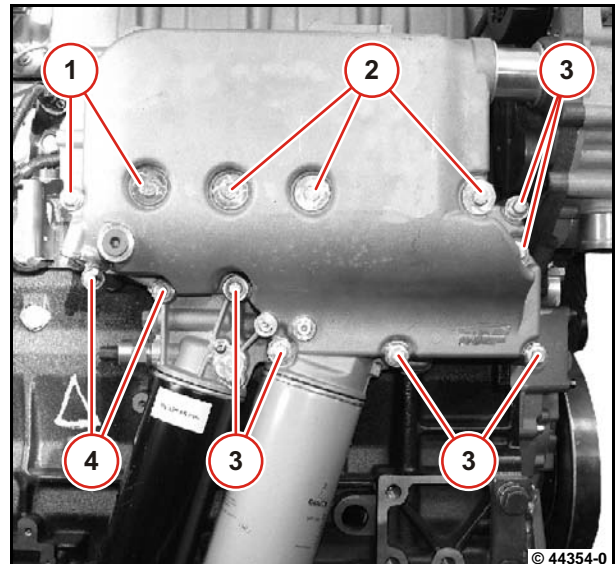
Collect draining fuel and dispose of according to regulations.



- Unscrew screws (1).
- Unscrew screws (2).
- Unscrew screws (3).
- Unscrew screws (4).



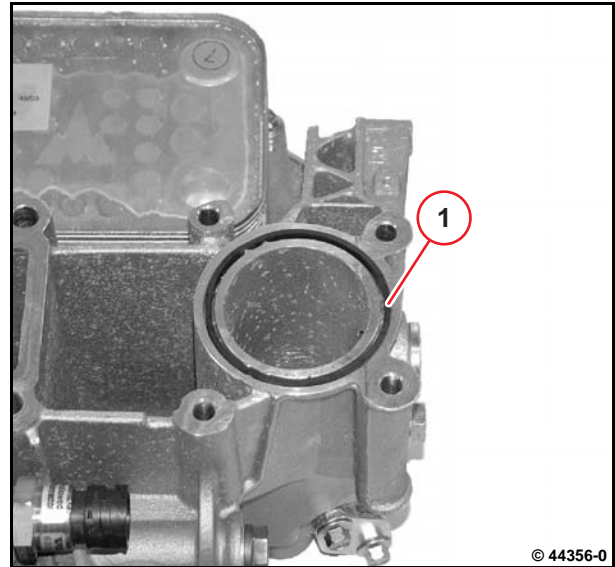
Note different screw lengths.



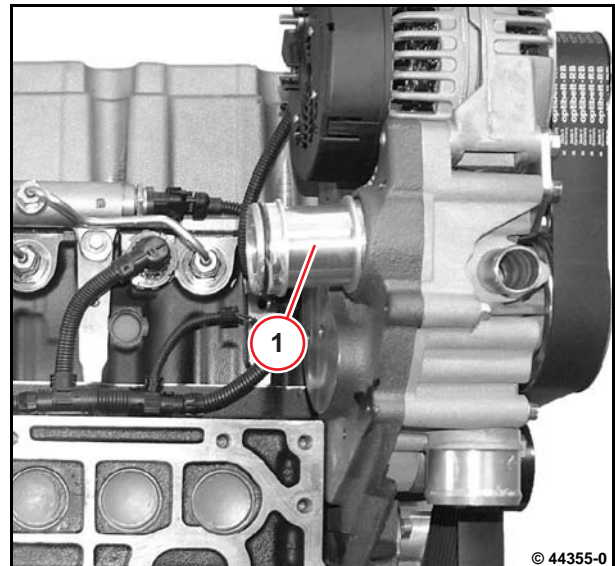
- Remove gasket (1).



- Remove sealing ring (1).



- Pull out compensating pipe (1).



- Remove O-rings with disassembly tool.

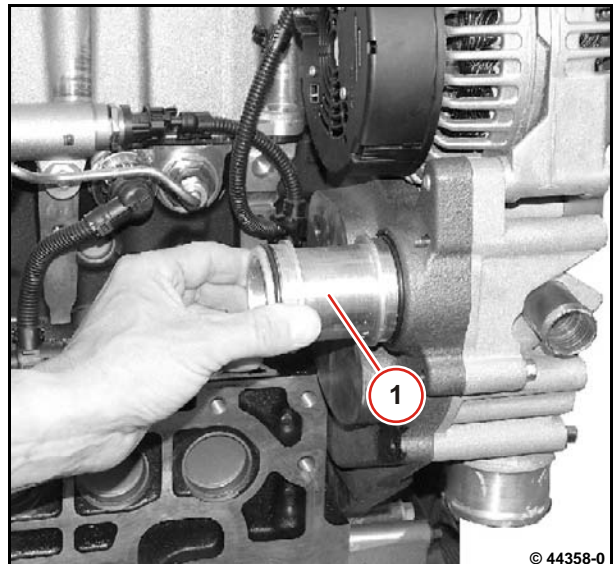


## Installing the oil cooler housing

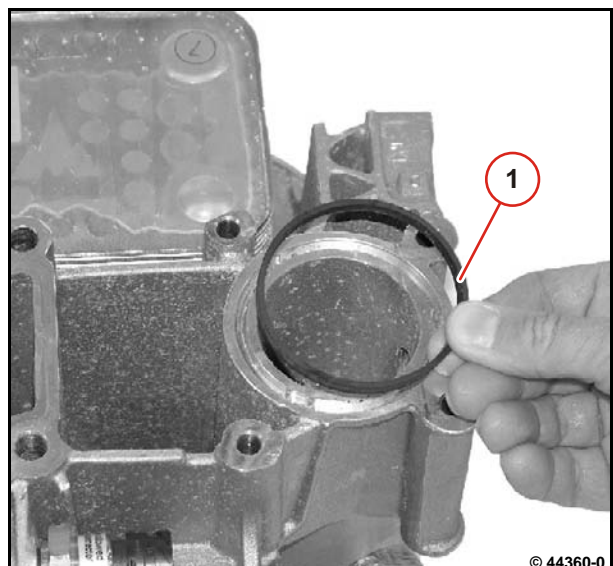
- Insert new O-rings.



- Coat the O-rings with fitting compound.
- Insert compensating pipe (1).



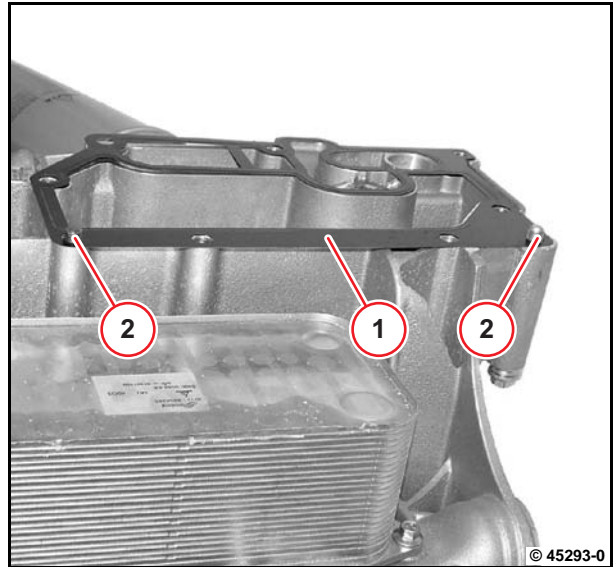
- Insert sealing ring (1).
- Coat the sealing ring with fitting compound.



- Mount new gasket (1).
- Tighten screws (2).

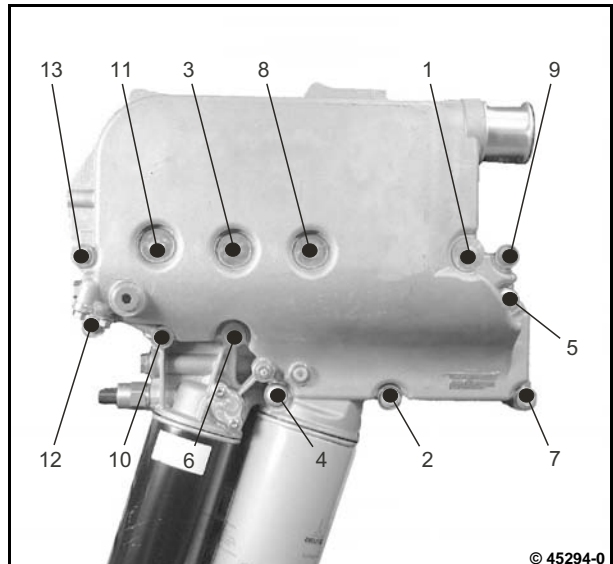




The gasket is stopped by the screw thread.

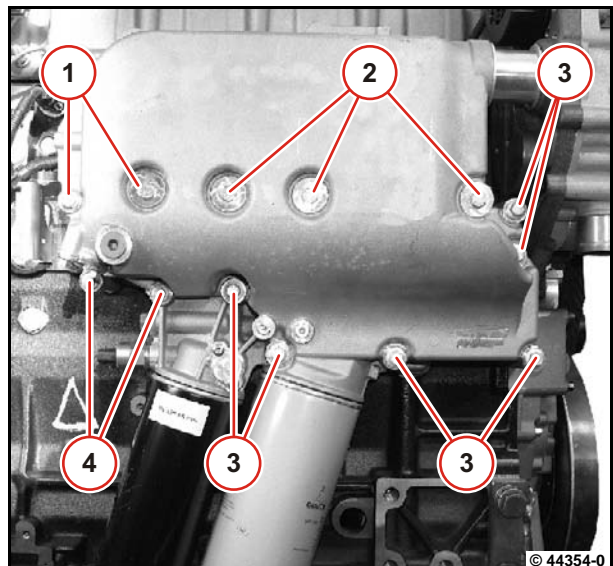


6

- Mount oil cooler housing.
- Fasten all screws.
- Tighten the screws according to the tightening sequence.

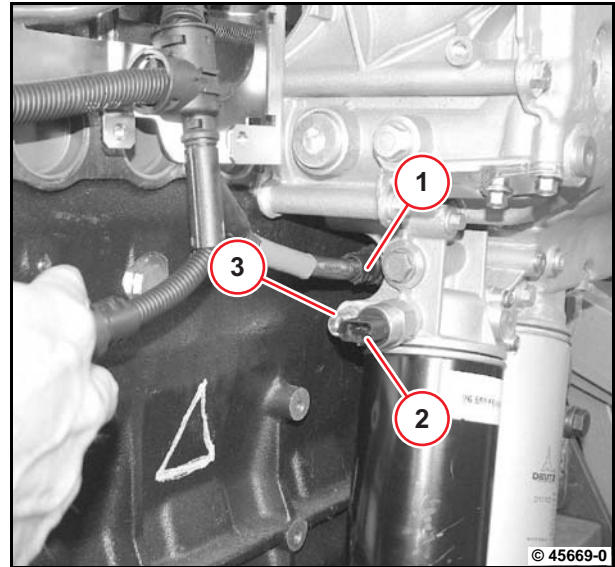


- Tighten screws .
  - (Items 1, 4):  
 A08 050
  - (Items 2, 3):  
 A08 051





- Screw on the cable plug (1).
- Plug in the cable plug (2).
- Screw on fuel pipe (3).



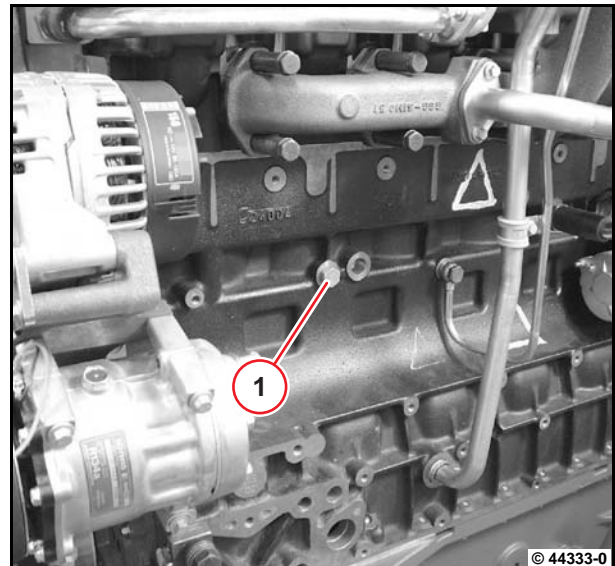
- Tighten screw plug (1).

 **A03 007**

- Fill engine oil according to operating instructions.
- Fill cooling system according to the operating manual.



Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operation manual.



## Removing and installing the oil pressure switch



Commercial available tools

Special tools:

- Long socket wrench insert . . . . . 110700
- Plugs/caps . . . . . 170160



– User notes



Pay attention to utmost cleanliness when working on the lube oil system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling lube oils.

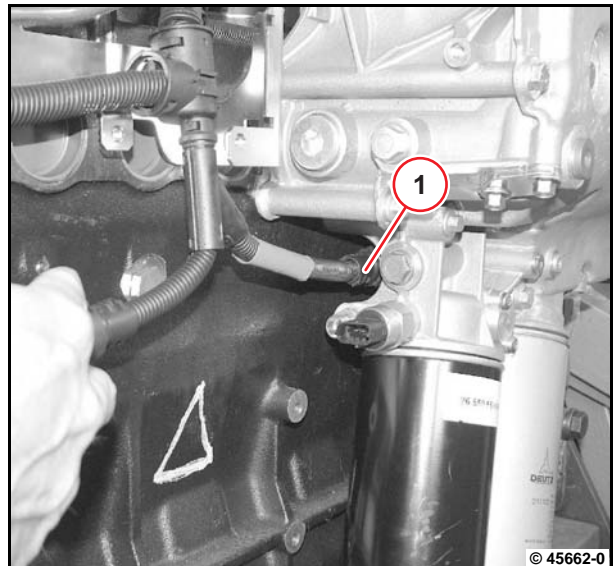
Close all connections immediately after opening with new, clean plugs/caps.

Do not remove plugs/caps until immediately before assembling.

6

### Removing the oil pressure switch

- Loosen the locking ring (1).
- Pull out cable plug.

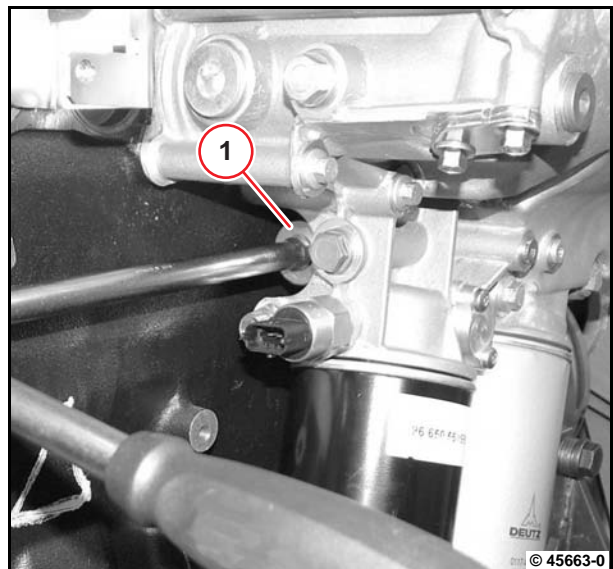


- Unscrew oil pressure switch with the socket wrench insert (1).



Collect draining engine oil and dispose of according to regulations.

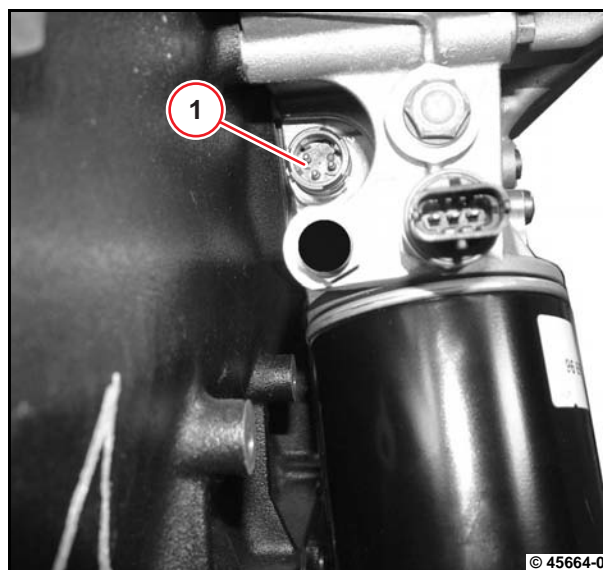
- Visually inspect the component.



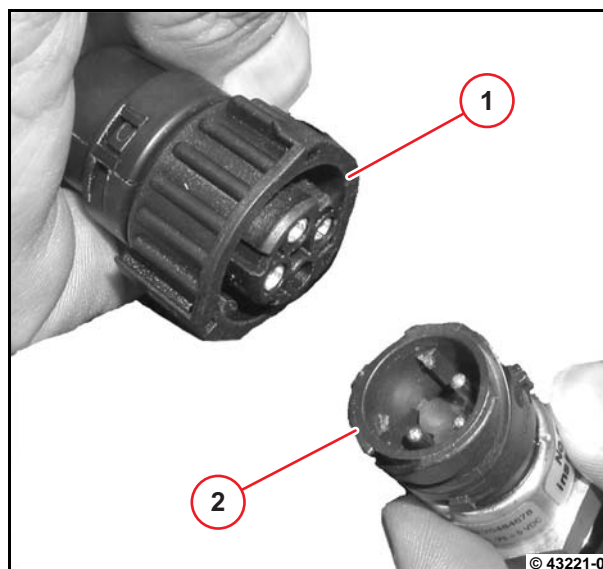
## Installing the oil pressure switch

- Mount new O-ring.
- Install oil pressure switch (1) with the socket wrench insert.

 A08 091



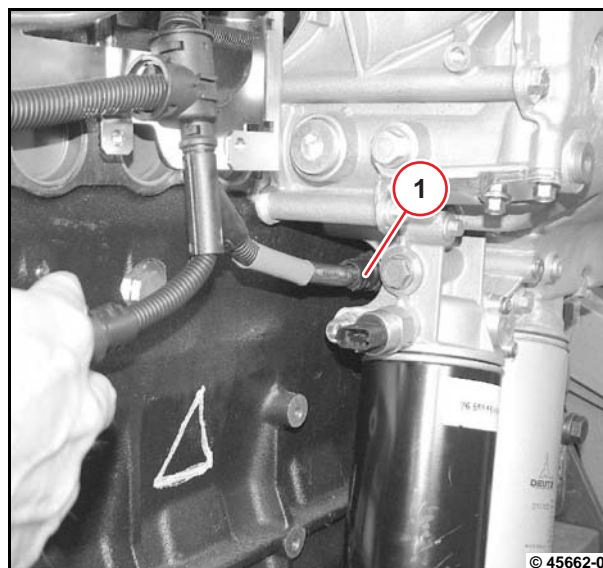
- Position the cable plug (1) of the oil pressure switch (2) so that the contacts match.



- Press the cable plug onto the oil pressure switch.
- Turn in the locking ring (1) until it snaps in.



Ensure that the connection is perfect.





## Removing and installing the coolant pump



Commercial available tools



– Fitting compound  
DEUTZ AP1908



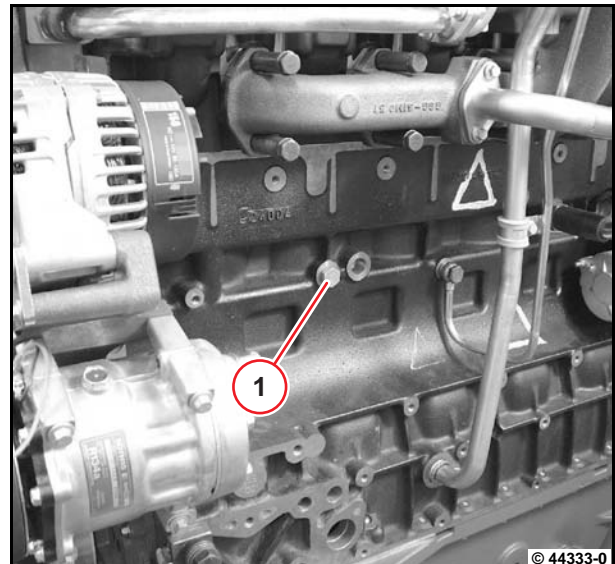
– W 13-02-03  
– Operation manual



Collect leaking operating substances in suitable vessels and dispose of according to regulations.  
The appropriate documentation of the vehicle/equipment manufacturer should be observed for emptying and filling the cooling system.

### Removing coolant pump

- Unscrew locking screws (1).
- Drain, collect and dispose of coolant according to regulations.



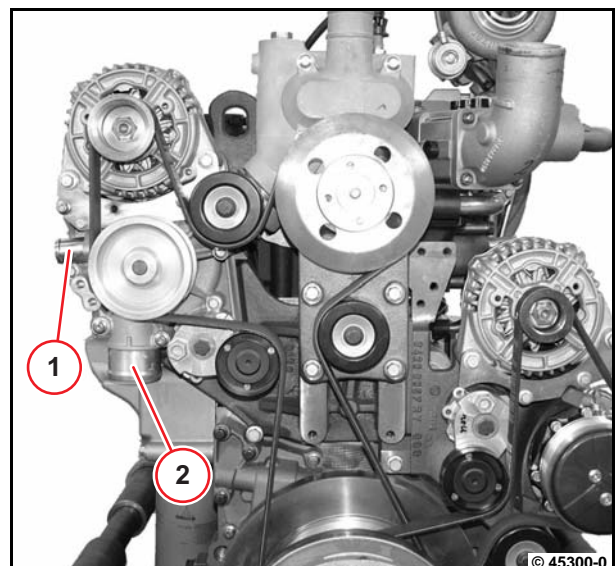
- Remove generator (operating side).

 W 13-02-03


- Remove hose pipe (1).
- Remove hose pipe (2).



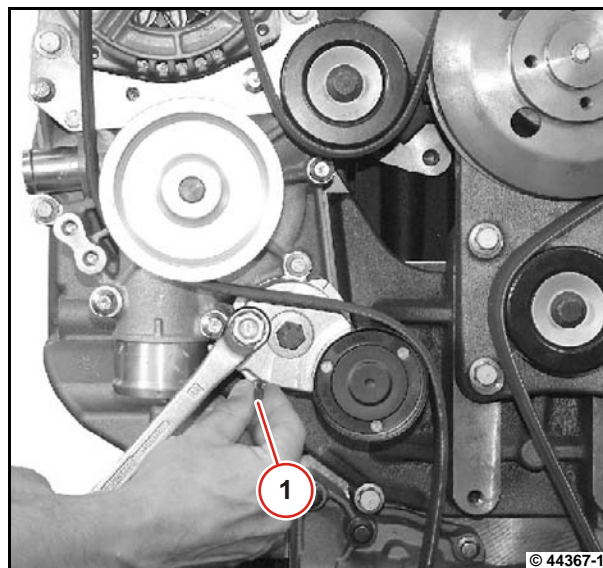
Collect and dispose of coolant according to regulations.



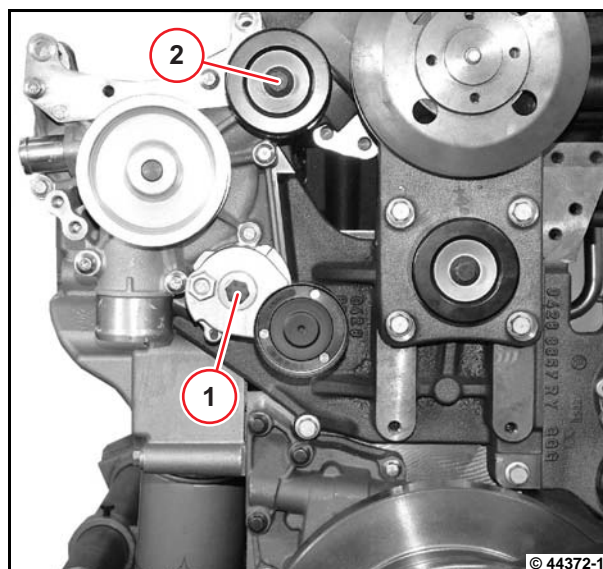
- Check the wear limit of the V-rib belt.

 Operation manual

- Relieve the V-rib belt tension with the belt tightener.
- Insert holding pin (1).
- Mark the running direction of the V-rib belt.
- Remove V-rib belt.



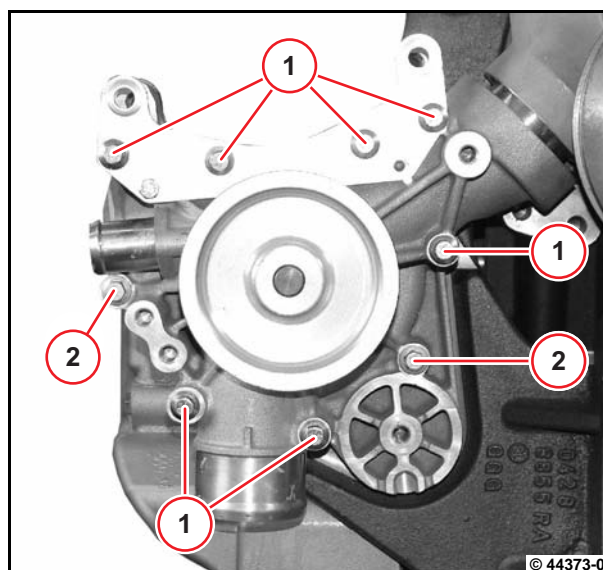
- Unscrew screw (1).
- Remove belt tightener.
- Unscrew screw (2).
- Remove idler roller.



- Unscrew screws (1).
- Unscrew screws (2).



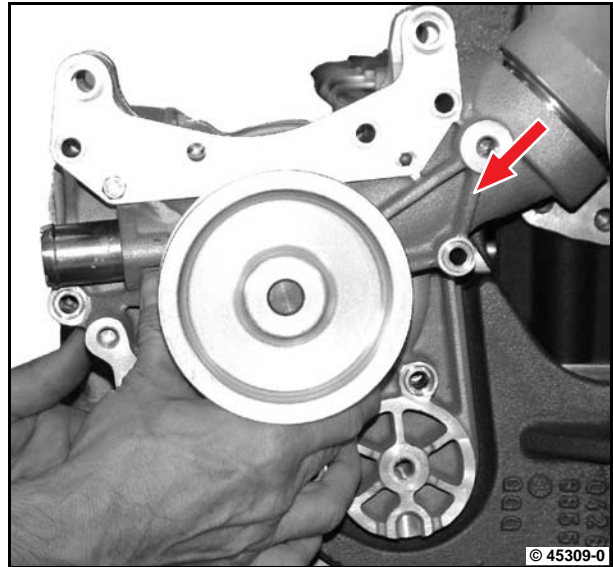
Note different screw lengths:



- Pull off coolant pump.
- Remove gasket.

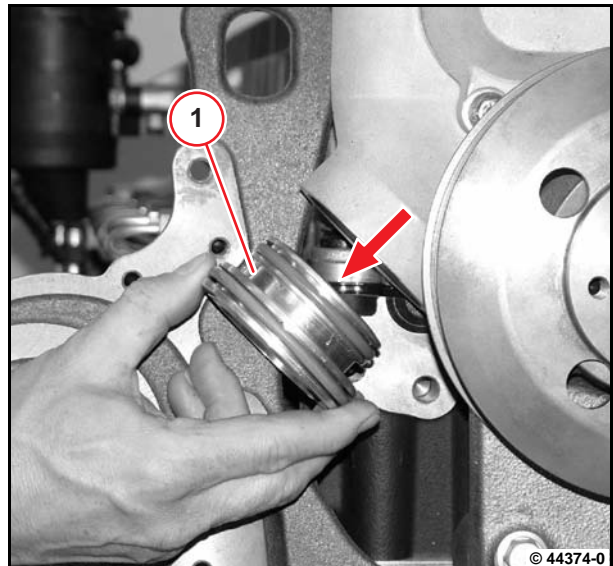


Collect and dispose of coolant according to regulations.



6

- Pull out plug element (1).
- Remove O-rings.
- Visually inspect the components.



### Installing coolant pump

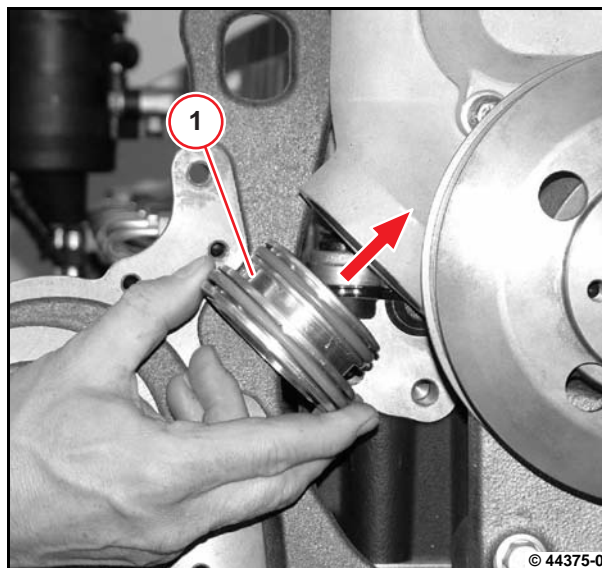
- Clean all sealing surfaces.
- Insert new O-rings.
- Coat the O-rings with fitting compound.



- Insert plug element (1).



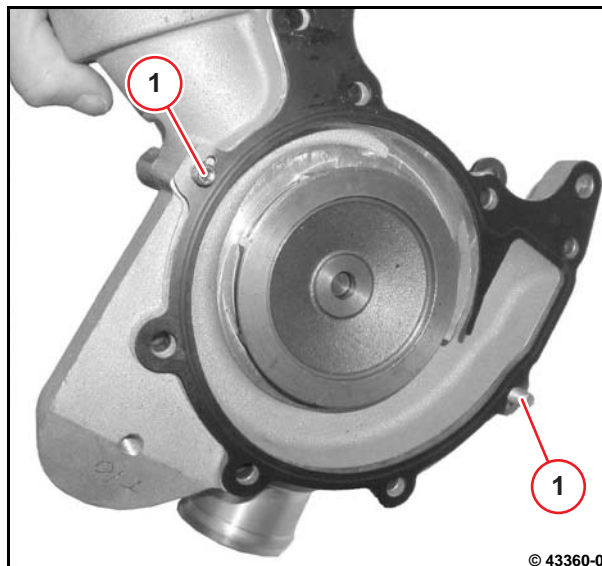
Press plug piece into stop.



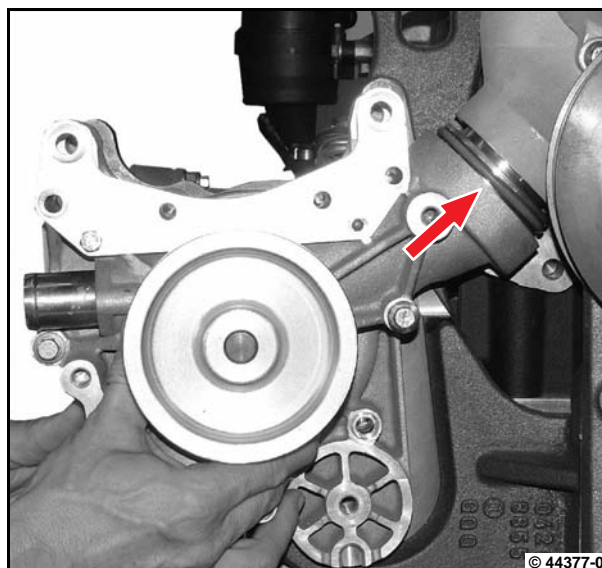
- Mount new gasket.
- Screw in screws (1).
- Turn in the screws a few turns into the gasket.



The gasket is stopped by the screw thread.



- Push the coolant pump onto the plug piece first.



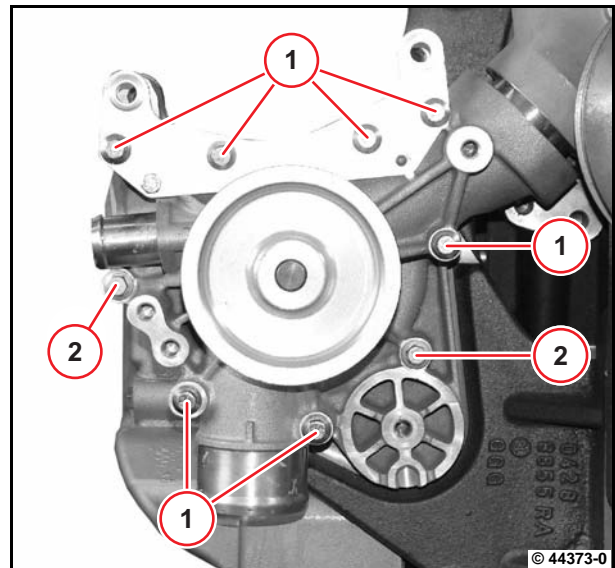


- Tighten screws (1) and (2).

 A09 010



Note different screw lengths:



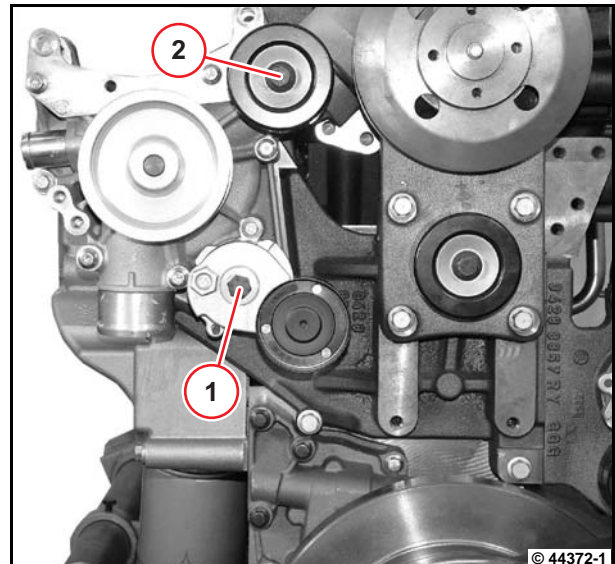
6

- Mount idler roller.
- Tighten screw (2).

 A12 041

- Mount the belt tightener.
- Tighten screw (1).

 A12 041



- Install generator.

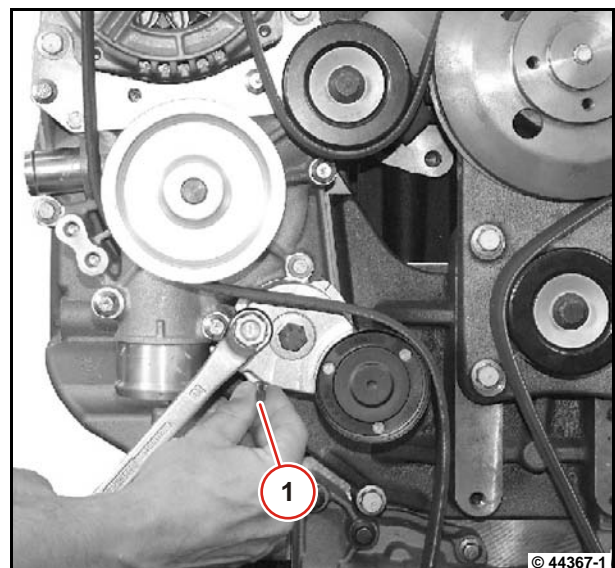
 W 13-02-03

- Fit the V-rib belt according to the running direction.
- Relieve the belt tightener.
- Remove holding pin (1).

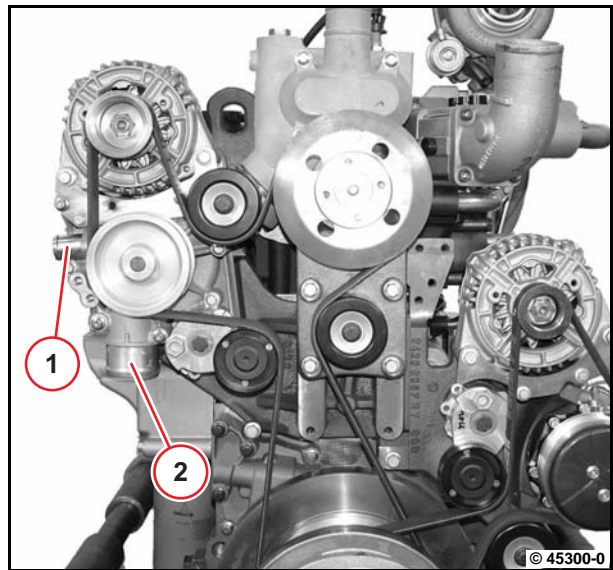



Ensure that the installation location is free from faults.

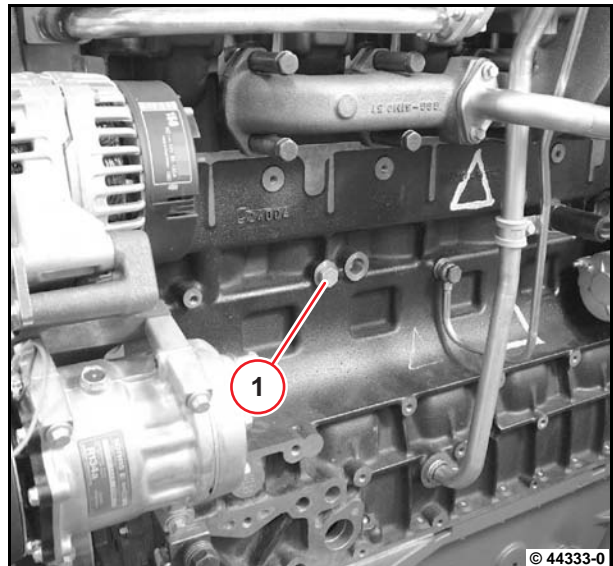
The belt tightener clamps the V-rib belt automatically.



- Install hose pipe (2).
- Install hose pipe (1).



- Tighten screw plug (1).
-  **A03 007**
- Fill cooling system according to the operating manual.



## Removing and installing the thermostat



Commercial available tools



– Operation manual



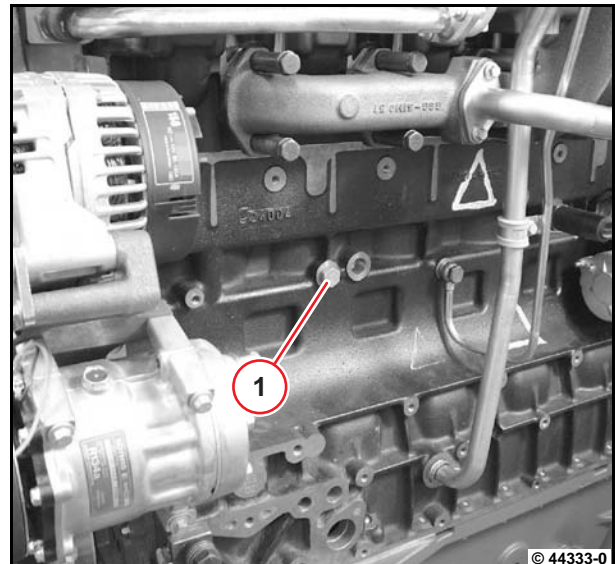
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

The appropriate documentation of the vehicle/equipment manufacturer should be observed for emptying and filling the cooling system.

6

### Removing the thermostat

- Unscrew locking screw (1).
- Drain, collect and dispose of coolant according to regulations.

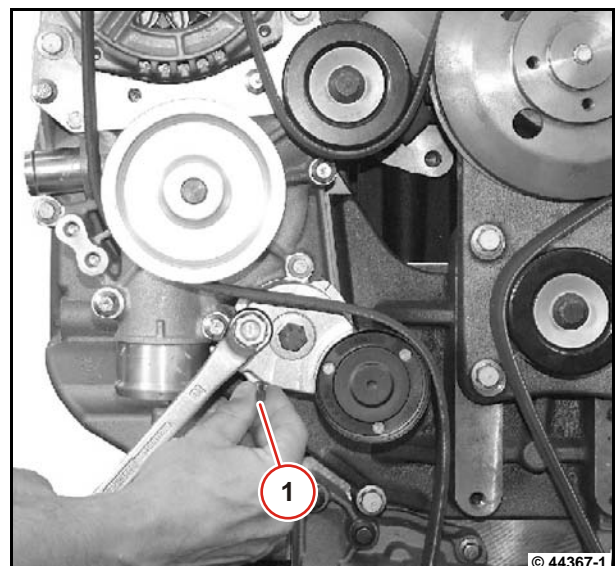


- Check the wear limit of the V-rib belt.



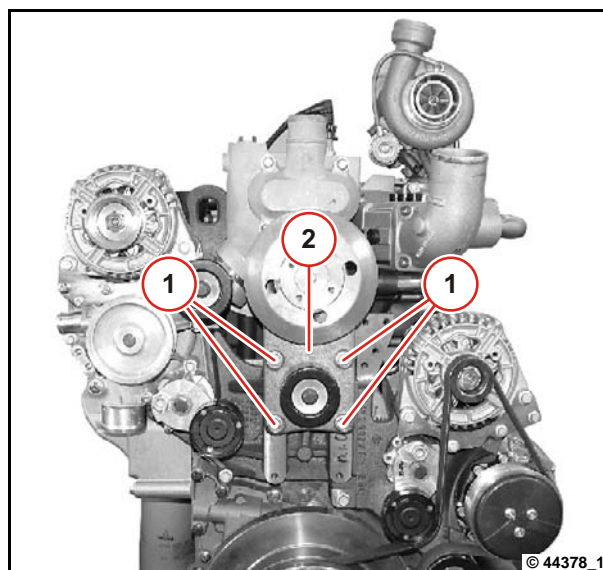
Operation manual


- Relieve the V-rib belt tension with the belt tightener.
- Insert holding pin (1).
- Mark the running direction of the V-rib belt.
- Remove V-rib belt.

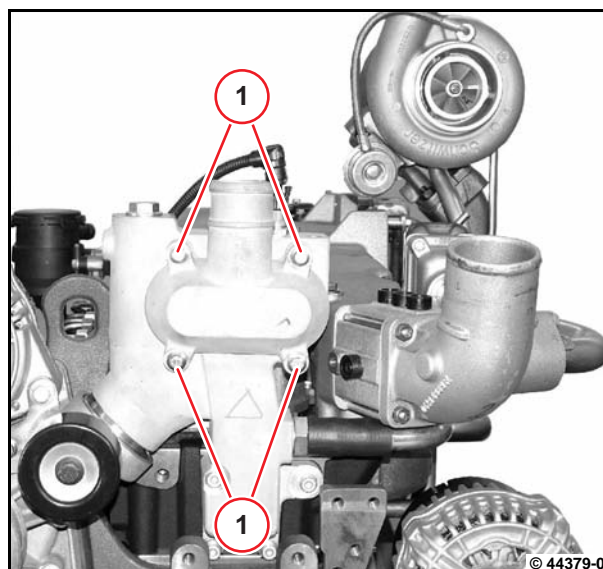





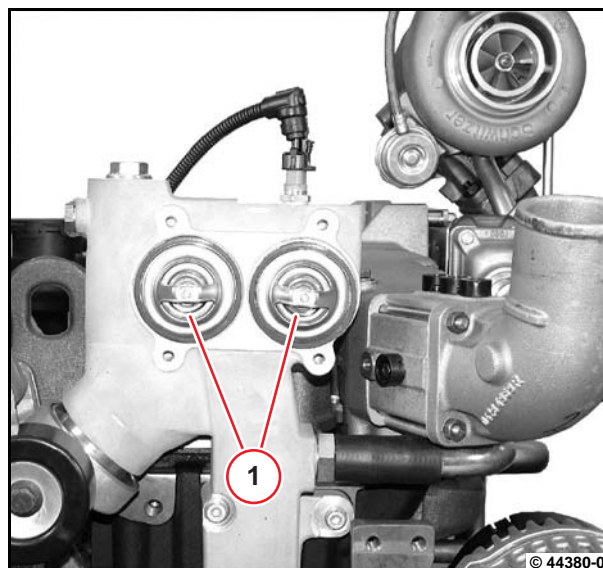
- Unscrew screws (1).
- Remove fan mounting (2).



- Unscrew screws (1).
  - Remove thermostat housing cover.
-  Collect and dispose of coolant according to regulations.

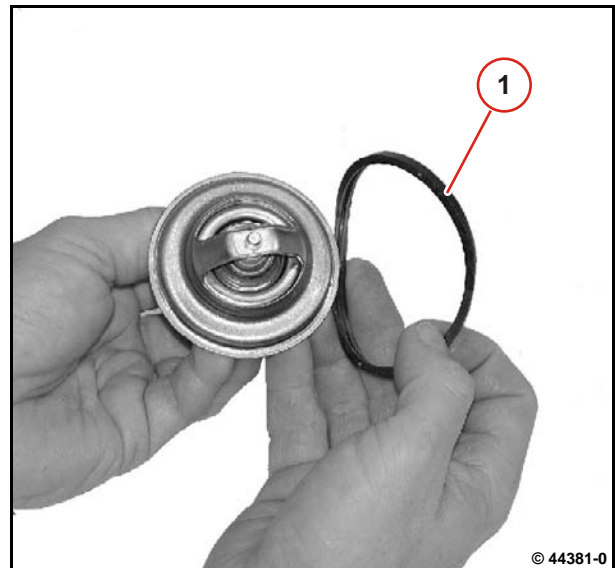


- Remove both thermostats (1).
-  Collect and dispose of coolant according to regulations.

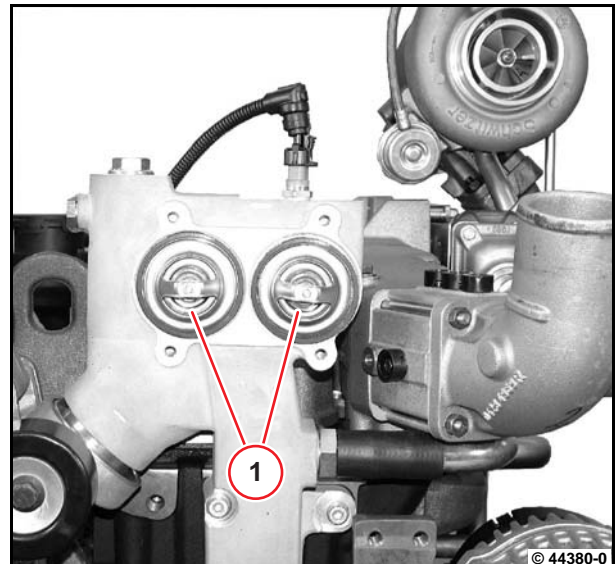


**Installing the thermostat**

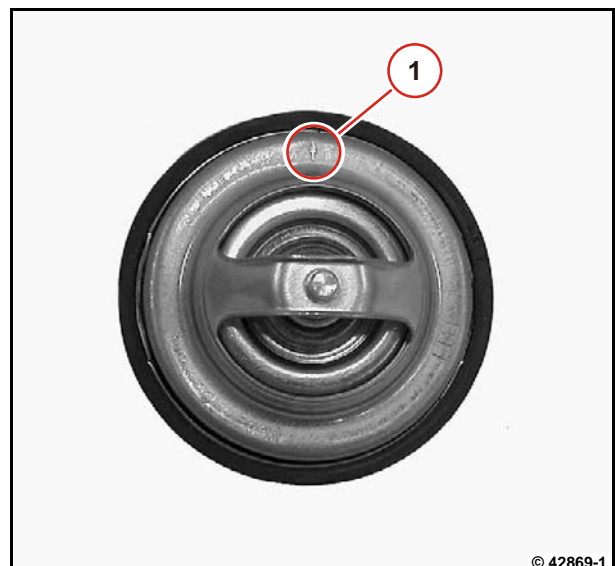
- Insert new sealing ring (1).

**6**

- Insert both thermostats (1).

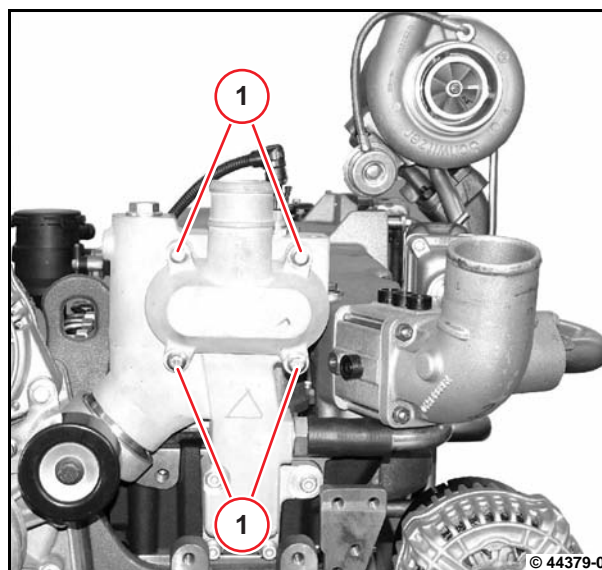


Arrow (1) points up.



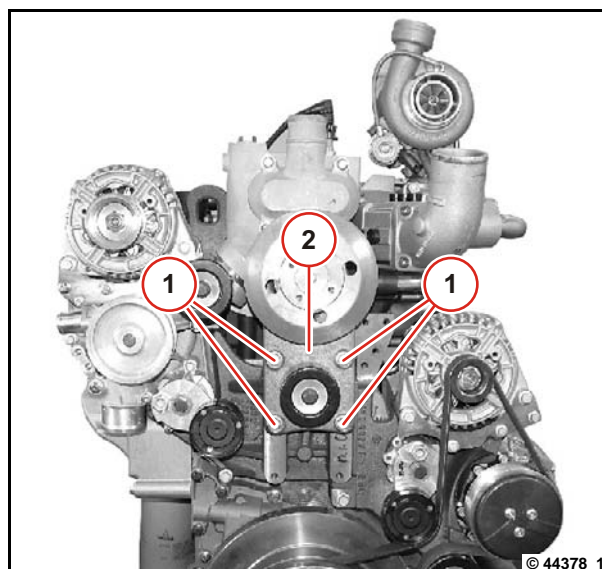
- Mount thermostat housing cover.
- Tighten screws (1).

 A09 002



- Install fan mounting (2).
- Tighten screws (1).

 A09 010

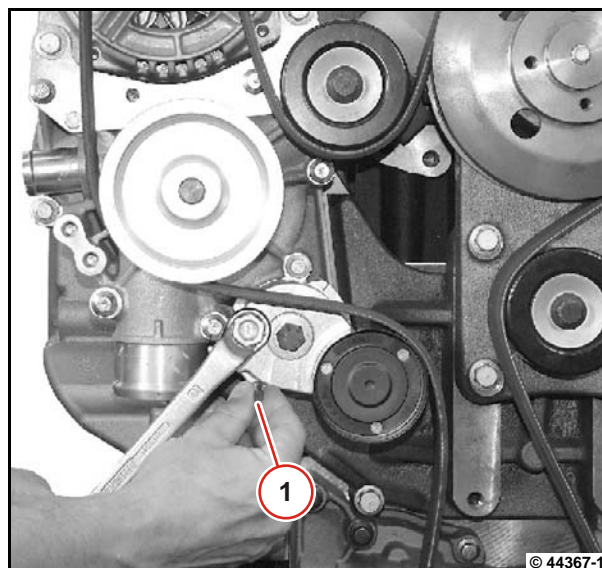


- Fit the V-rib belt according to the running direction.
- Relieve the belt tightener.
- Remove holding pin (1).

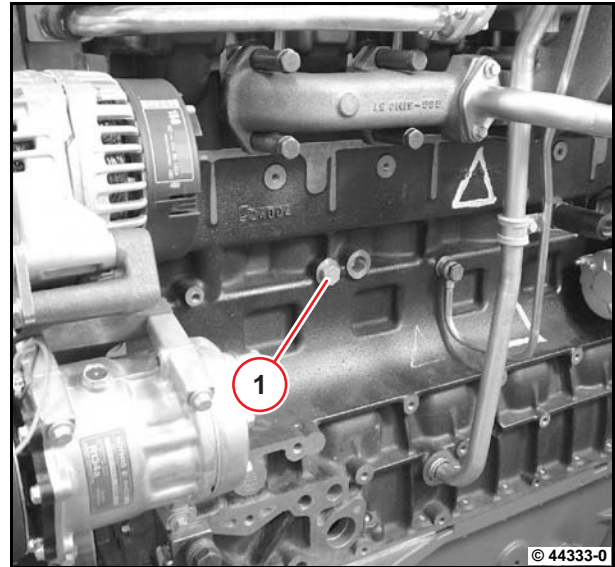


Ensure that the installation location is free from faults.

The belt tightener clamps the V-rib belt automatically.



- Tighten screw plug (1).

**A03 007**





## Removing and installing the thermostat housing



Commercial available tools



– Fitting compound  
DEUTZ AP1908



– Operation manual

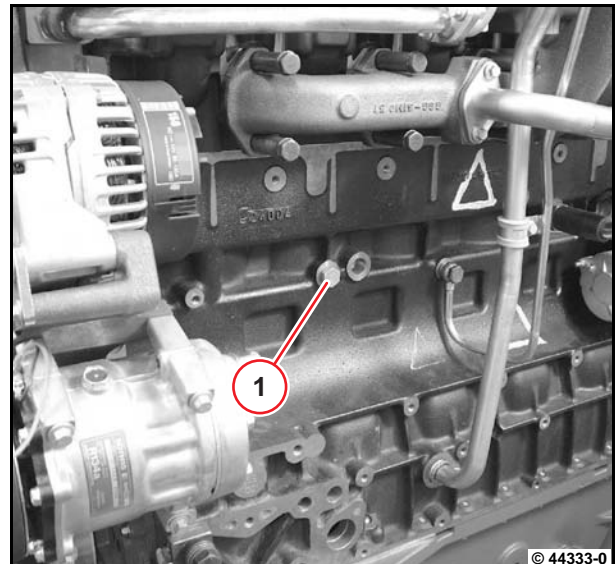


Collect leaking operating substances in suitable vessels and dispose of according to regulations.

The appropriate documentation of the vehicle/equipment manufacturer should be observed for emptying and filling the cooling system.

### Removing thermostat housing

- Unscrew locking screw (1).
- Drain, collect and dispose of coolant according to regulations.

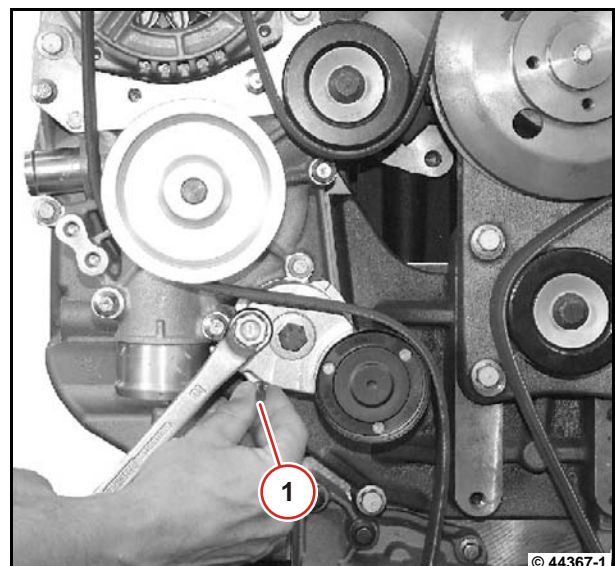


- Check the wear limit of the V-rib belt.



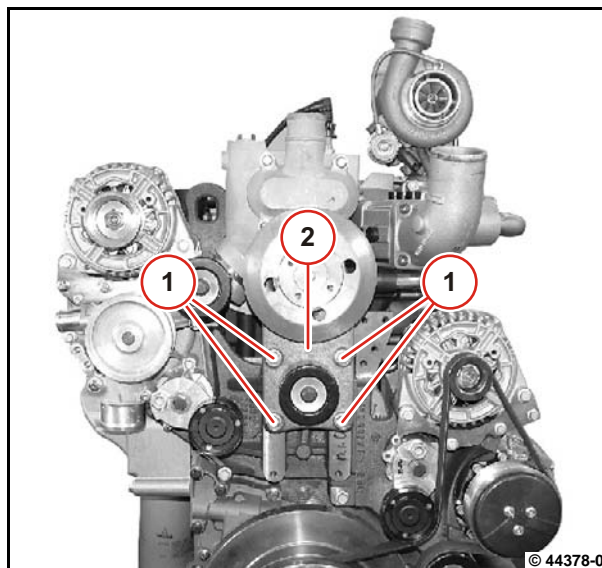
Operation manual

- Relieve the V-rib belt tension with the belt tightener.
- Insert holding pin (1).
- Mark the running direction of the V-rib belt.
- Remove V-rib belt.

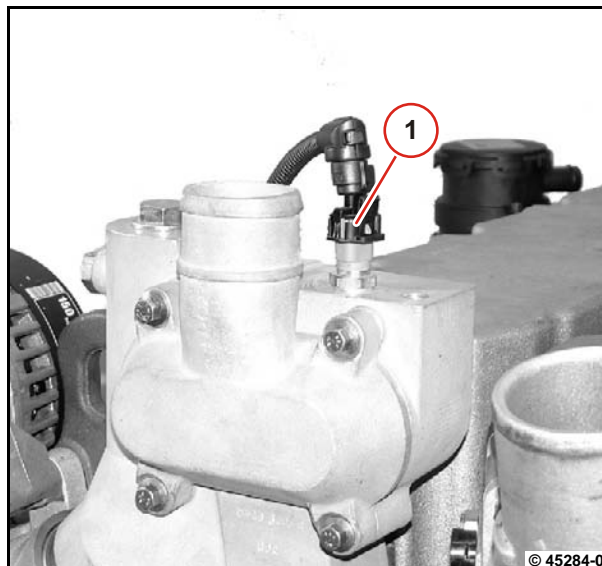




- Unscrew screws (1).
- Remove fan mounting (2).



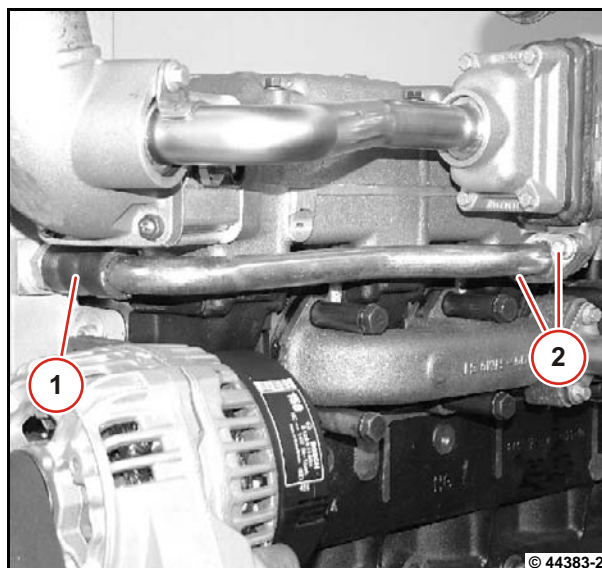
- Pull out cable plug (1).



- Loosen pipe clamp (1).
- Unscrew screws (2).
- Pull off pipe.



Collect and dispose of coolant according to regulations.

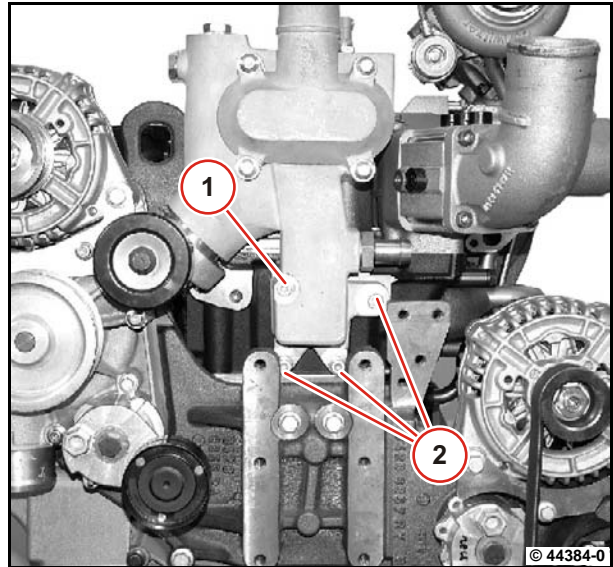


- Unscrew screw (1).
- Unscrew screws (2).



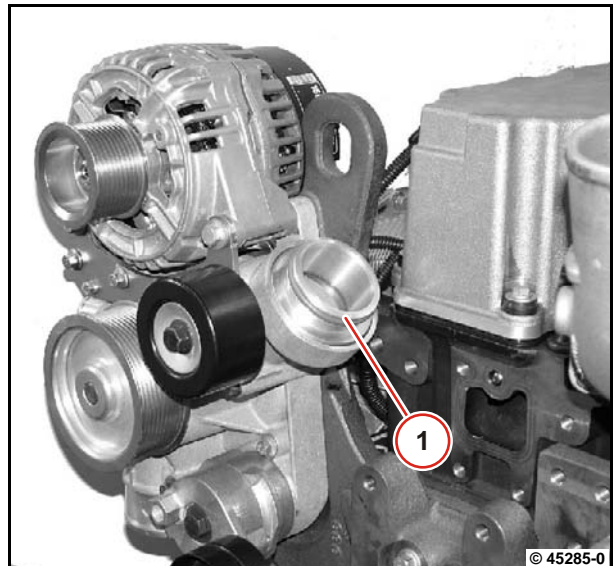
The lower screw cannot be removed.

- Remove thermostat housing.
- Remove gasket.



6

- Pull out plug element (1).

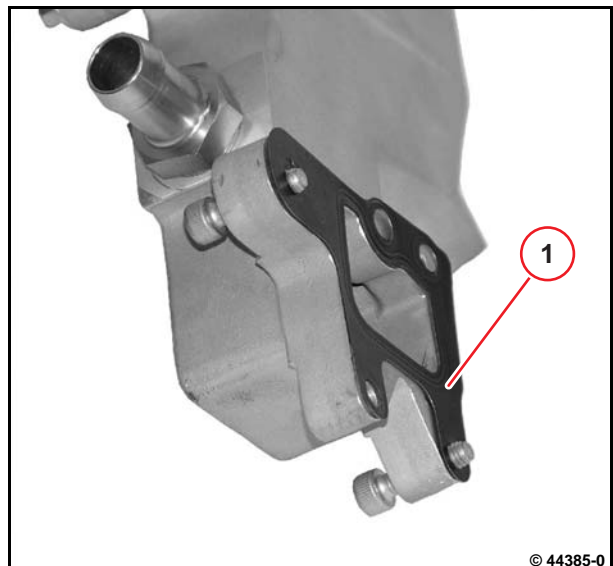


### Installing thermostat housing

- Clean sealing surfaces.
- Mount new gasket.

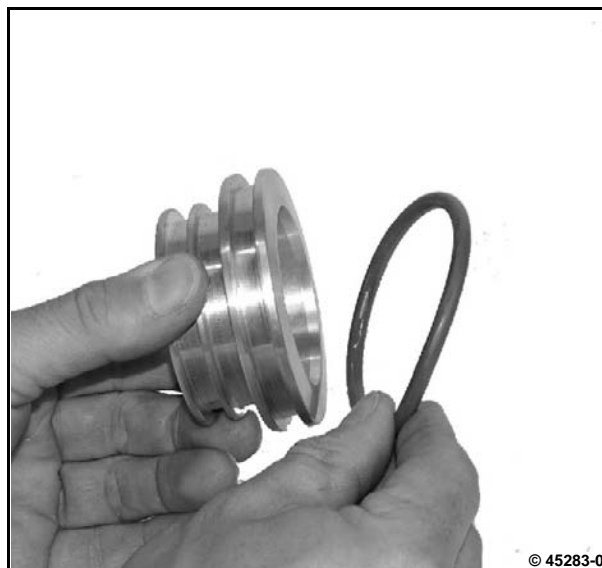


The gasket is stopped by the screw thread.

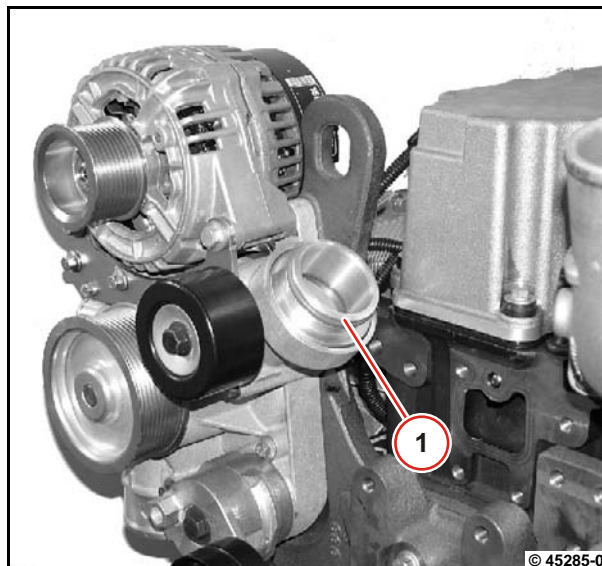


- Insert new O-rings.
- Coat the O-rings with fitting compound.

6



- Insert plug element (1).

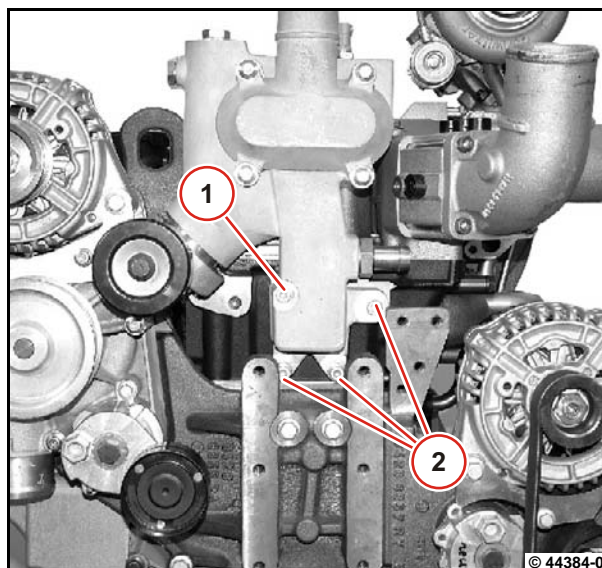



- Push the thermostat housing onto the plug piece first.
- Tighten screws (2).

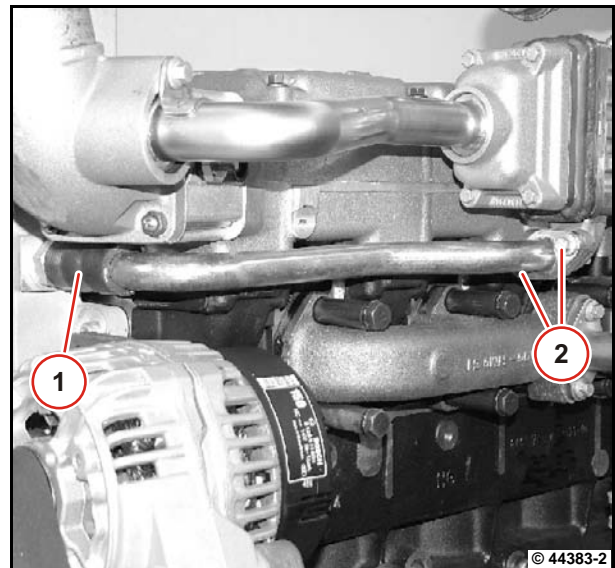
 A09 001

- Tighten screw (1).

 A09 001

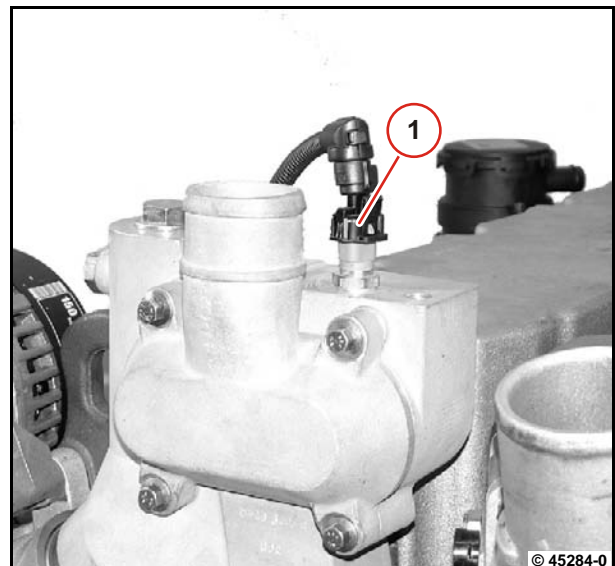


- Push on coolant pipe.
- Tighten screw (2).
-  A09 080
- Tighten pipe clip (1).



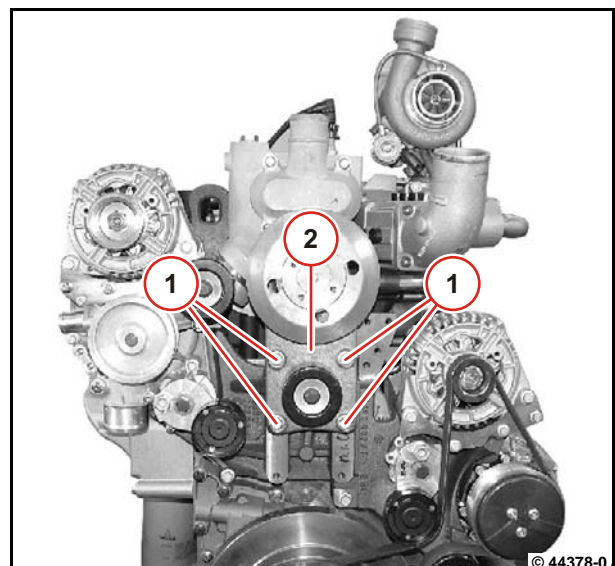
6

- Plug cable plug (1) onto temperature transmitter.



- Install fan mounting (2).
- Tighten screws (1).

 A09 010



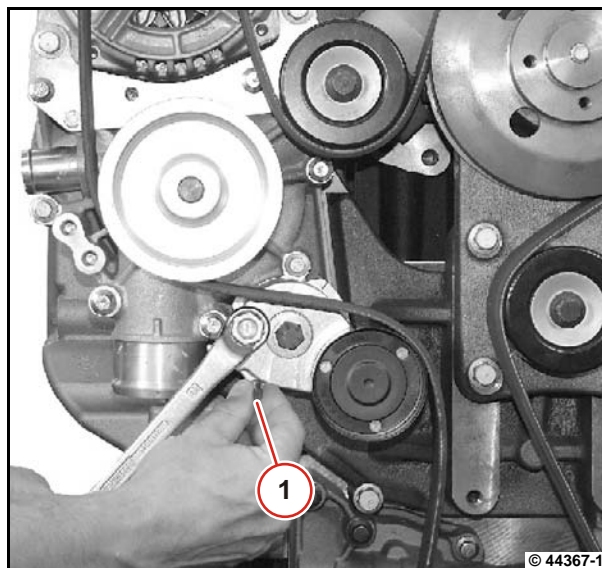


- Fit the V-rib belt according to the running direction.
- Relieve the belt tightener.
- Remove holding pin (1).



Ensure that the installation location is free from faults.

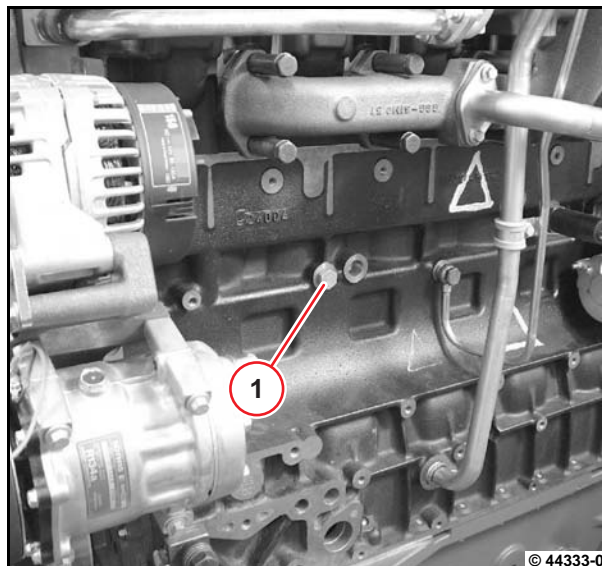
The belt tightener clamps the V-rib belt automatically.



- Tighten screw plug (1).



A03 007



## Removing and installing temperature transmitter



Commercial available tools



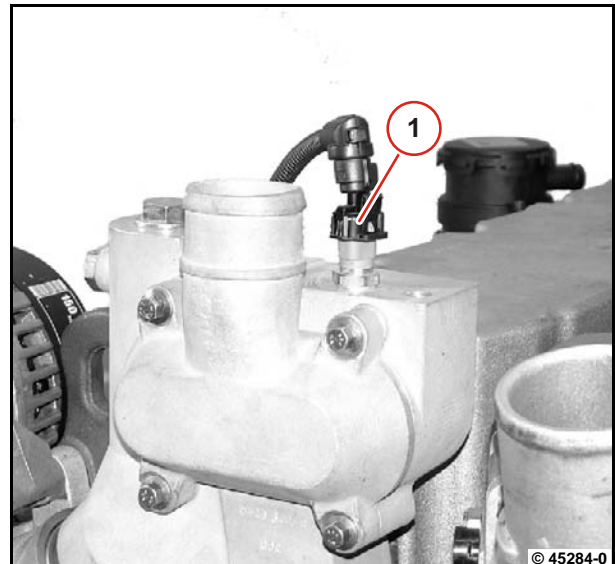
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

The appropriate documentation of the vehicle/equipment manufacturer should be observed for emptying and filling the cooling system.

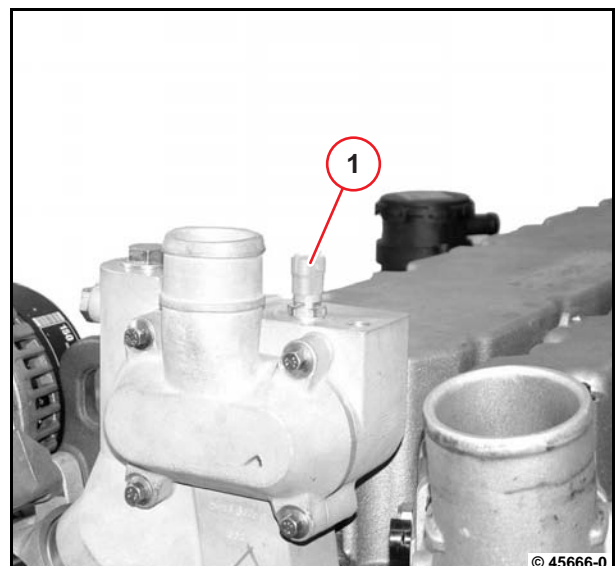
**6**

### Removing temperaure transmitter

- Unlock cable plug (1) and remove.



- Unscrew temperature transmitter (1).
- Visually inspect the component.

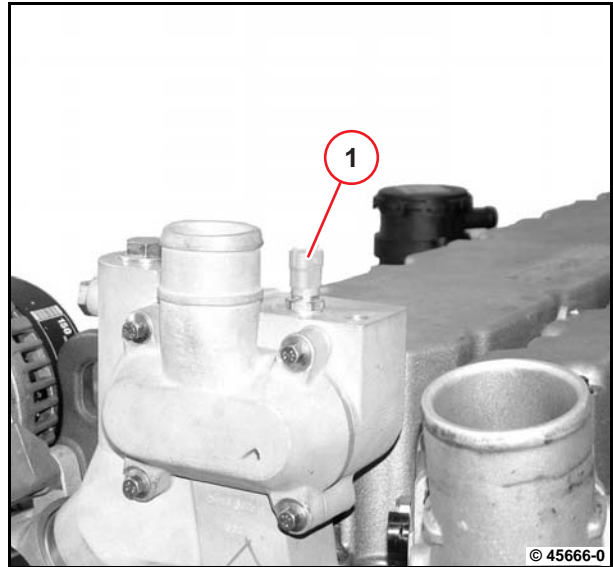




### Installing temperature transmitter

- Screw temperature transmitter (1) into the thermostat housing and tighten.

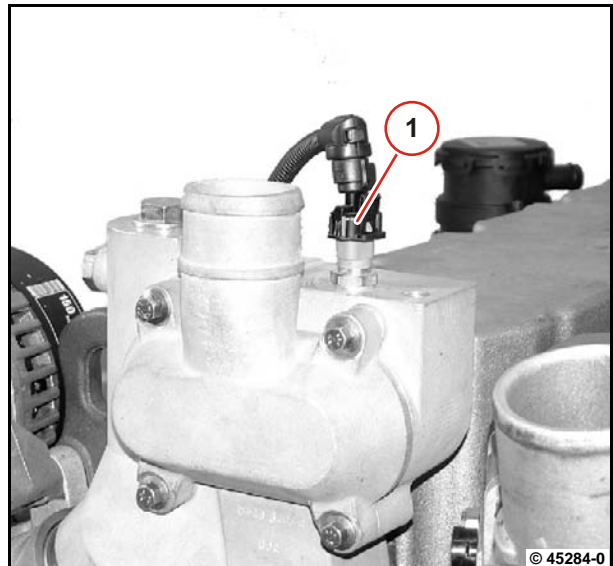
 **A09 031**



- Plug cable plug (1) onto temperature transmitter.



Ensure that the connection is perfect.



## Removing and installing torsional vibration damper



Commercial available tools:

- Socket wrench insert Torx E20 ..... 8114
- Rotation angle disc ..... 8190

Special tools:

- Turn-over gear ..... 100370

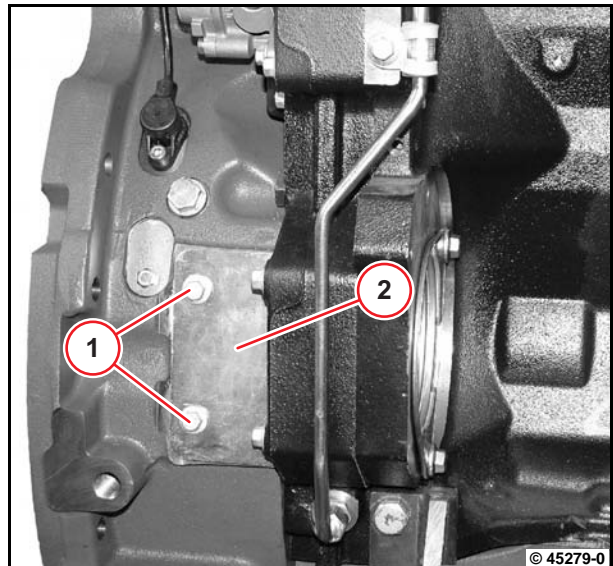


– Operation manual

6

### Removing the torsional vibration damper

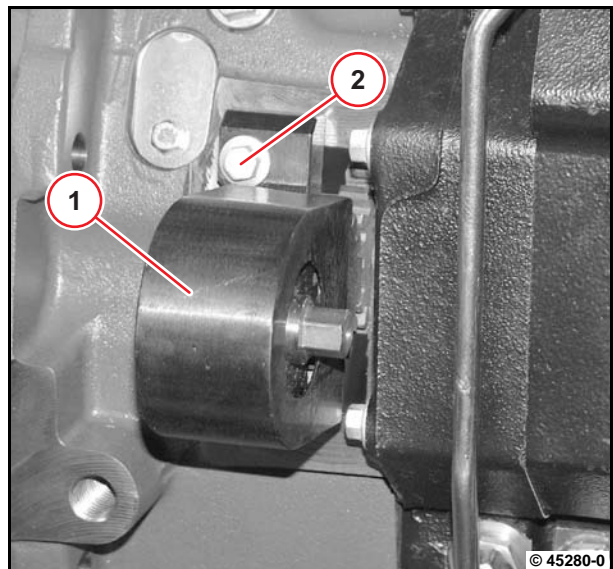
- Unscrew screws (1).
- Remove cover (2).



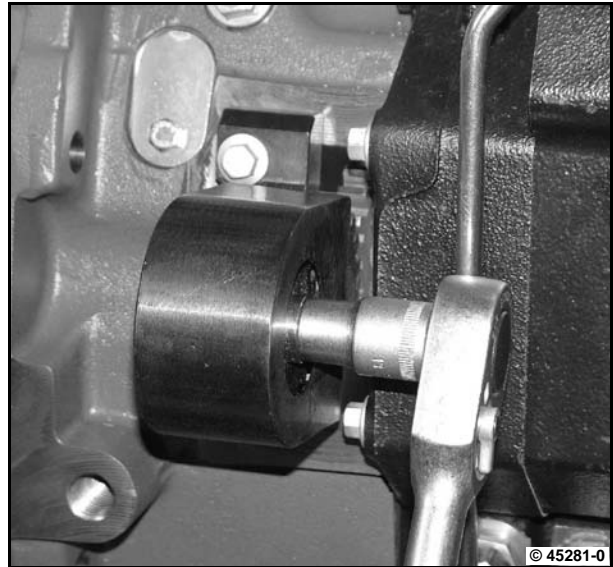
- Insert turn-over gear (1).
- Tighten screw (2).



A03 085



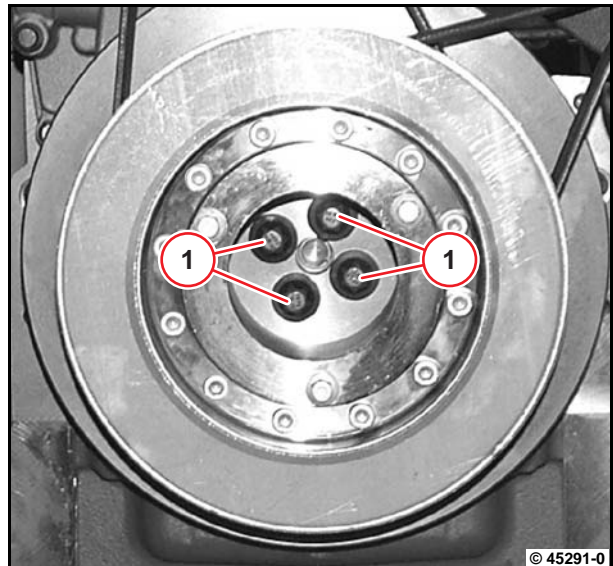
- Block flywheel with turning gear.



- Loosen screws (1).



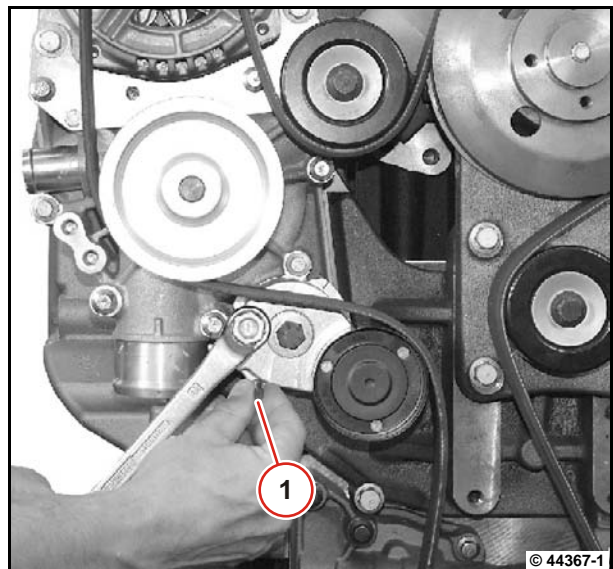
Use socket wrench insert.



- Check the wear limit of the V-rib belt.

 Operation manual

- Relieve the V-rib belt tension with the belt tightener.
- Insert holding pin (1).
- Mark the running direction of the V-rib belt.
- Remove V-rib belt.

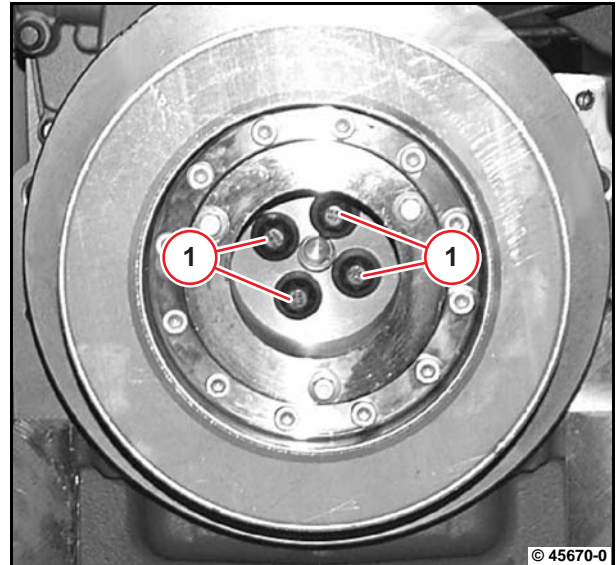


- Unscrew screws (1) with the socket wrench insert.
- Remove the torsional vibration damper.



**Danger!**

Risk of injury!



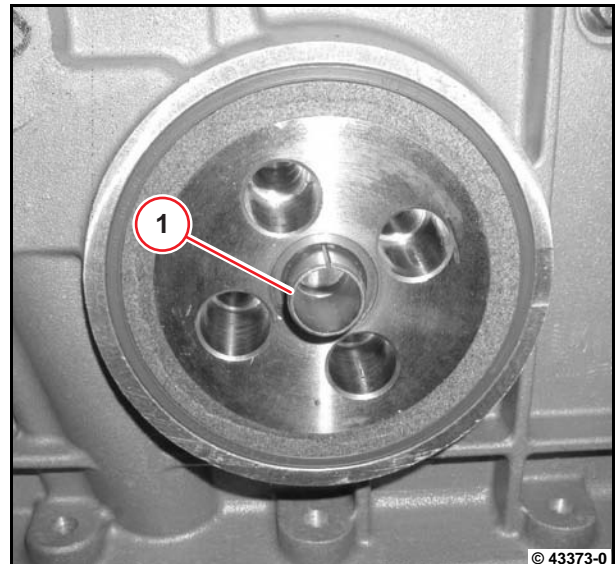
6

**Installing the torsional vibration damper**

- Insert clamping bushing (1).



Observe position of clamping sleeve.

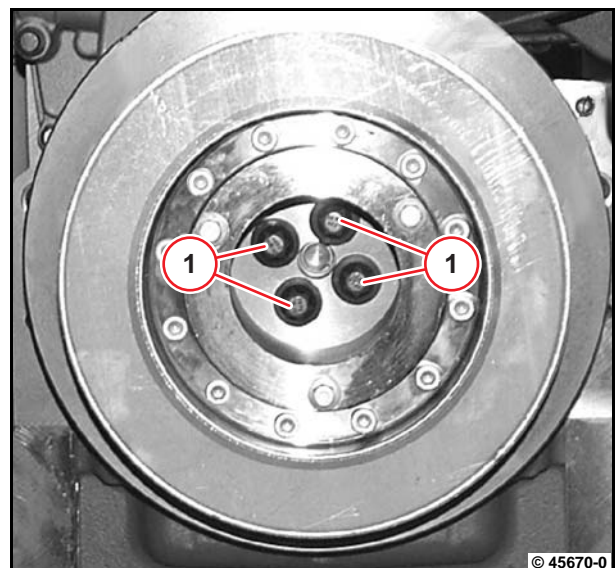


- Mount the torsional vibration damper.
- Tighten screws (1).



**Attention!**

Use new screws.



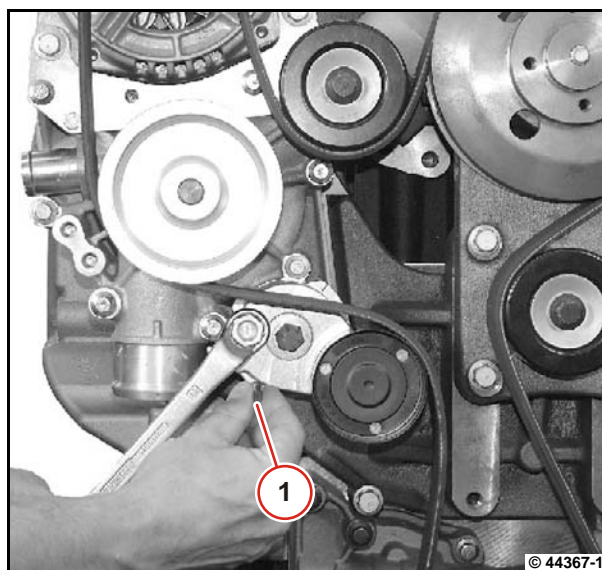


- Fit the V-rib belt according to the running direction.
- Relieve the belt tightener.
- Remove holding pin (1).

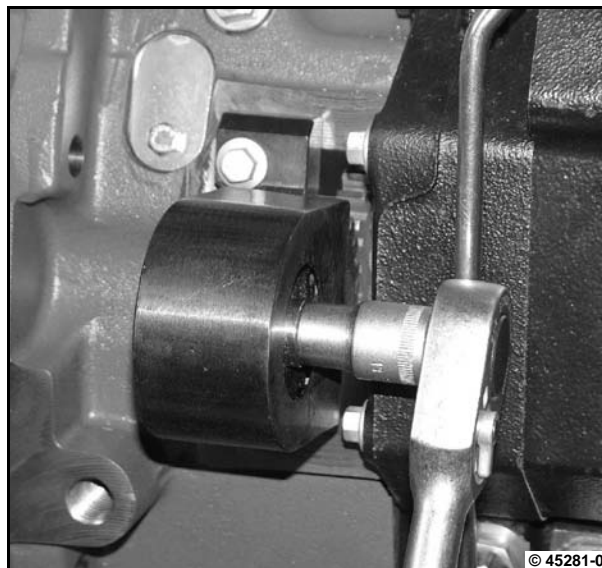


Ensure that the installation location is free from faults.

The belt tightener clamps the V-rib belt automatically.



- Block flywheel with turning gear.



- Tighten screws (1).

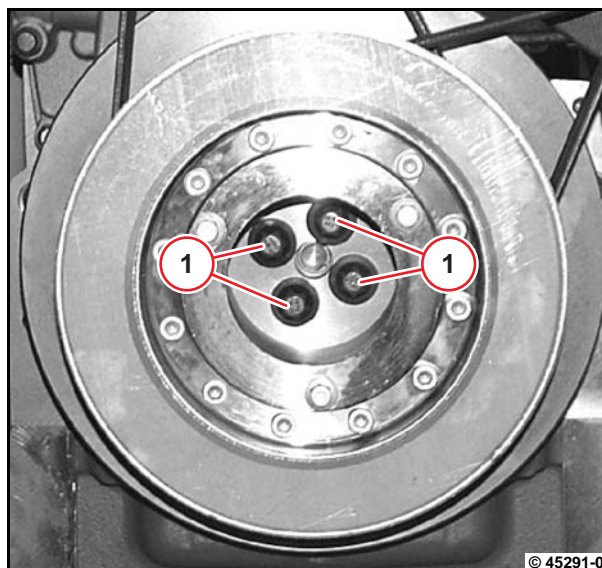


A12 030

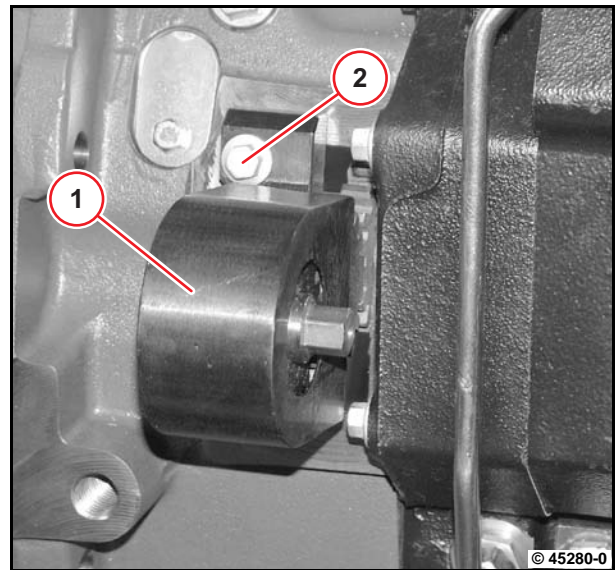


**Attention!**

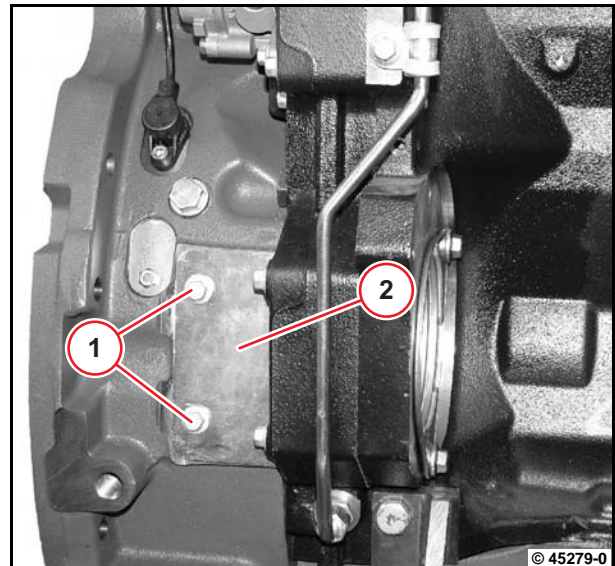
Use new screws.



- Unscrew screw (2).
- Remove turning gear (1).



- Mount cover (2).
- Tighten screws (1).

 **A03 085**





## Removing and installing the flywheel

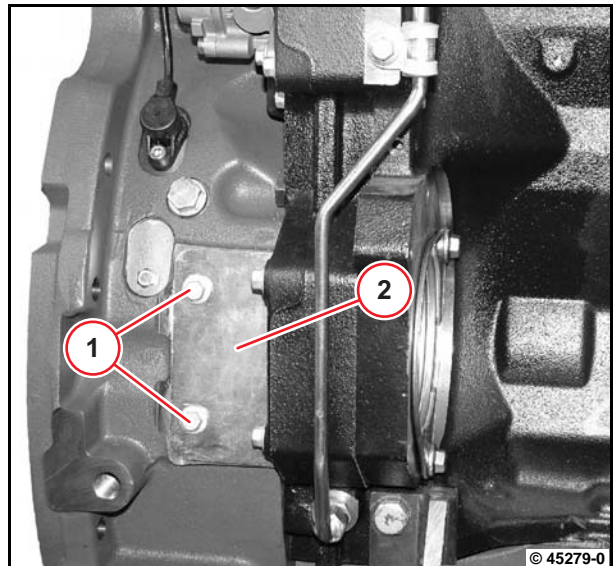


Commercial available tools:

- Rotation angle disc . . . . . 8190
- Self-made mandrin guide
- Auxiliary screws

### Removing the flywheel

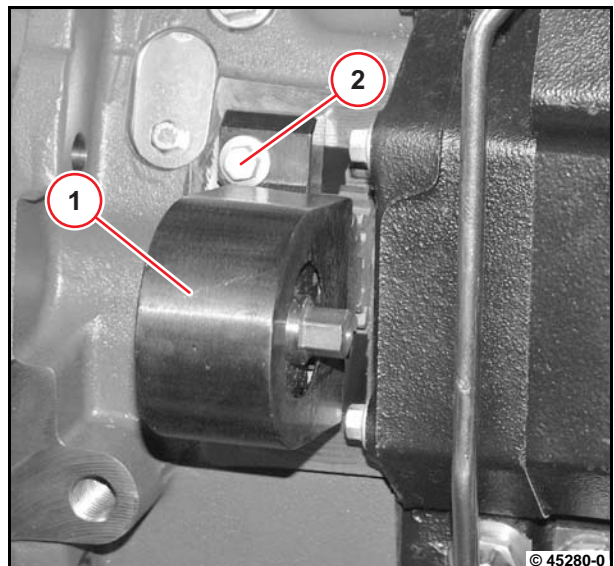
- Unscrew screws (1).
- Remove cover (2).



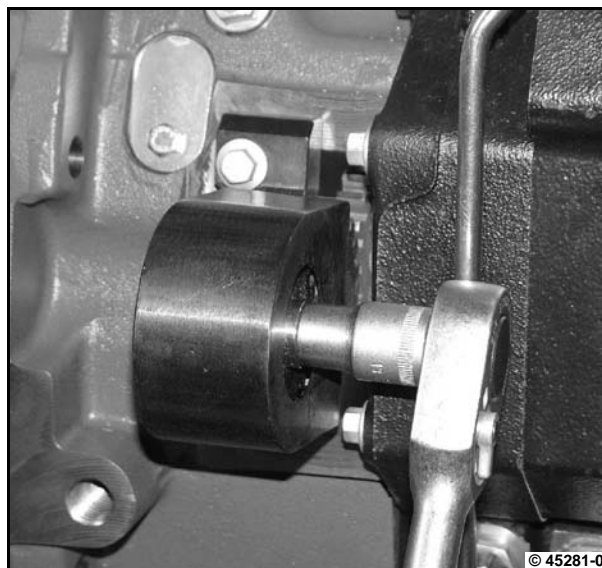
- Insert turn-over gear (1).
- Tighten screw (2).



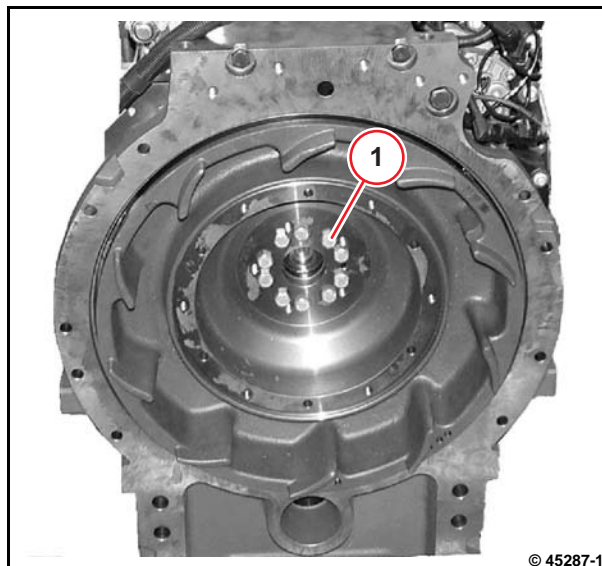
A03 085



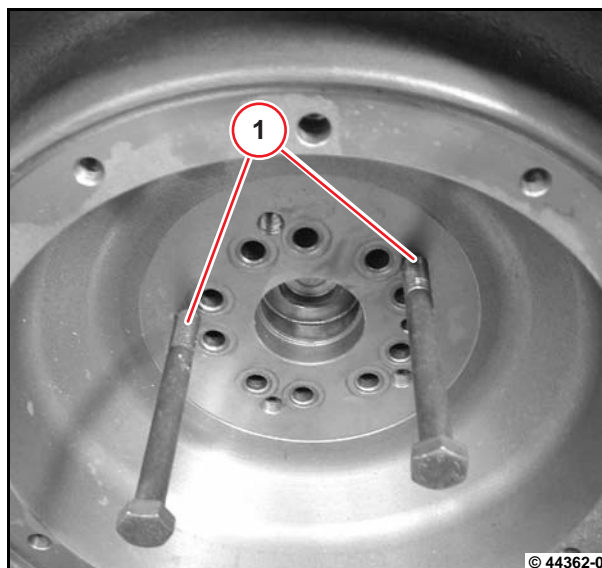
- Block flywheel with turning gear.



- Unscrew all screws (1).
- Remove turn-over gear.



- Screw in auxiliary screws (1).
- Remove flywheel.

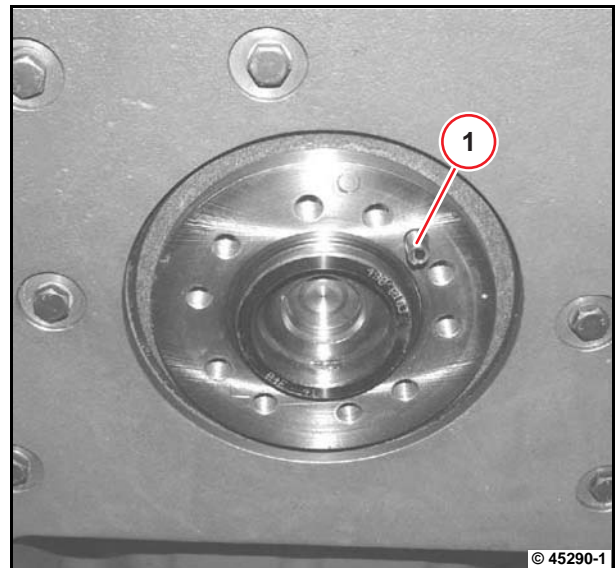


## Installing the flywheel

- Make sure the clamping bushing (1) is properly installed.
- Insert self-made mandrin guide.



For example: a pin bolt



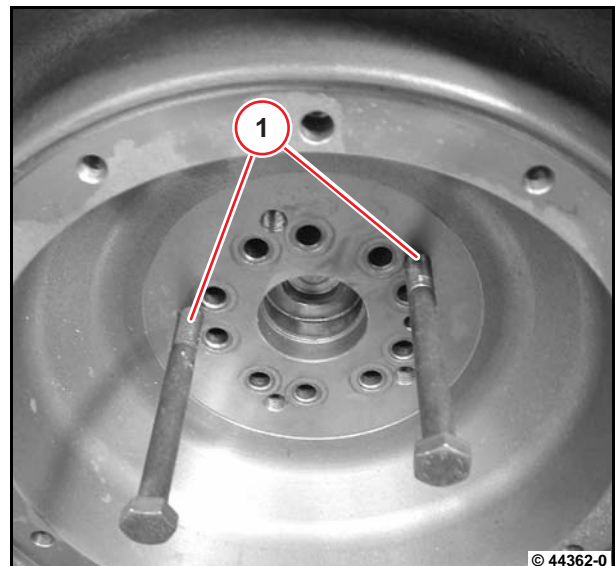
- Screw in auxiliary screws (1).
- Mount flywheel.



### Attention!

Use new screws.

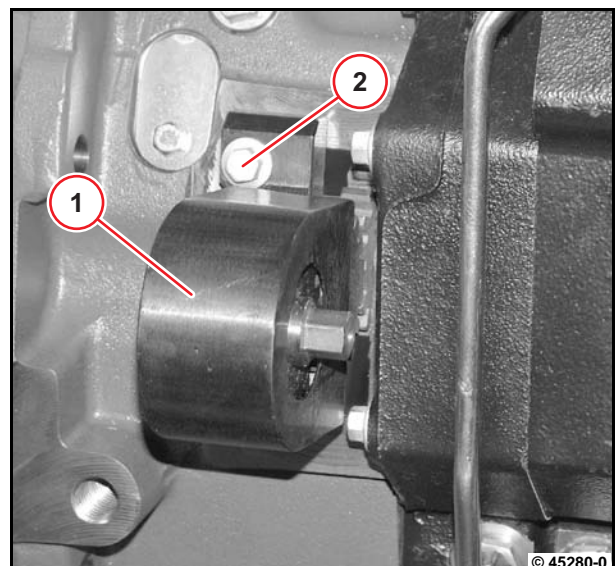
- Fasten screws.
- Remove auxiliary screws (1).
- Remove self-made mandrin guide.



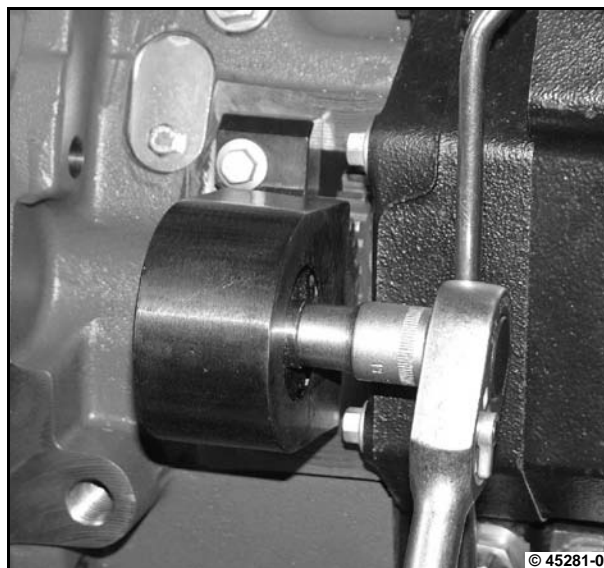
- Insert turn-over gear (1).
- Tighten screw (2).



A03 085

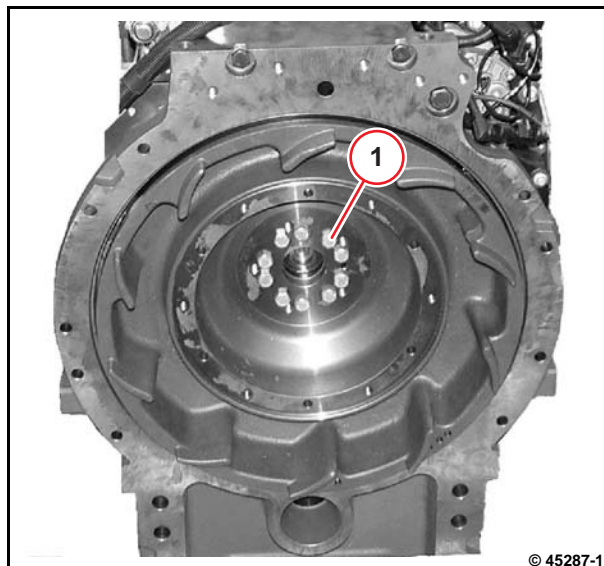


- Block flywheel with turning gear.

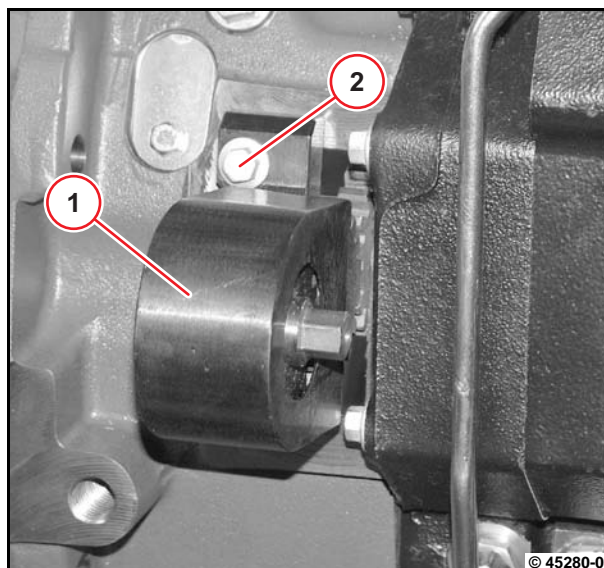


- Tighten all screws (1).

 A12 001

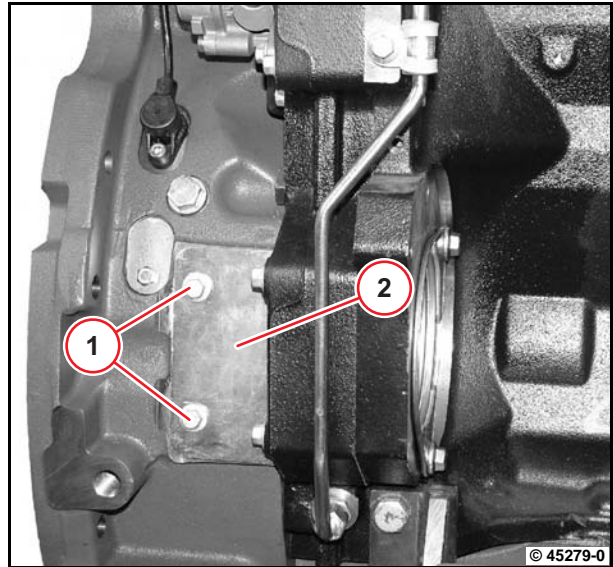


- Unscrew screw (2).
- Remove turning gear (1).





- Mount cover (2).
- Tighten screws (1).

 **A03 085**





## Removing and installing the air conditioning compressor



Commercial available tools



– Operation manual



### Attention!

The relevant documentation of the vehicle manufacturer must be observed when emptying and filling the air conditioning system.

6

### Removing air conditioning compressor

- Empty the air conditioning.
- Disconnect connection cables from air conditioning compressor.



### Attention!

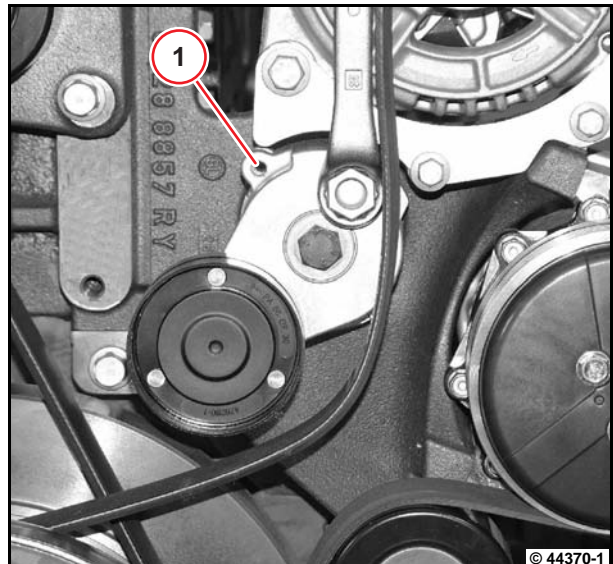
Observe instructions of vehicle manufacturer.

- Check the wear limit of the V-rib belt.



Operation manual

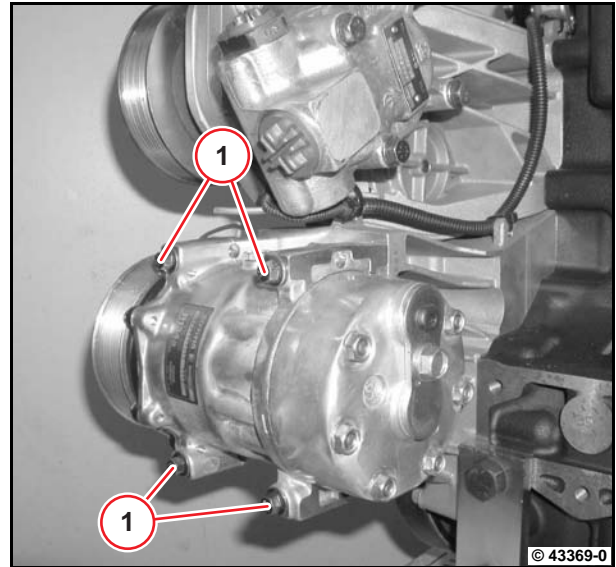
- Mark the running direction of the V-rib belt.
- Relieve the V-rib belt tension with the belt tightener.
- Insert holding pin (1).
- Remove V-rib belt.



- Disconnect cable plug connection from air conditioning compressor.



- Unscrew screws (1).
- Remove air conditioning compressor.

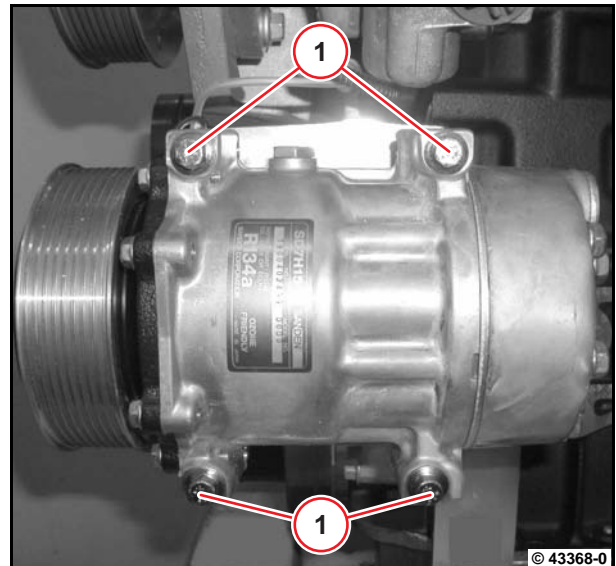


6

### Installing air conditioning compressor

- Install air conditioning compressor.
- Tighten screws (1).

 [A12 051](#)



- Connect cable plug for air conditioning compressor.



- Relieve the belt tightener.
- Remove holding pin (1).
- Lay V-rib belt according to its run.

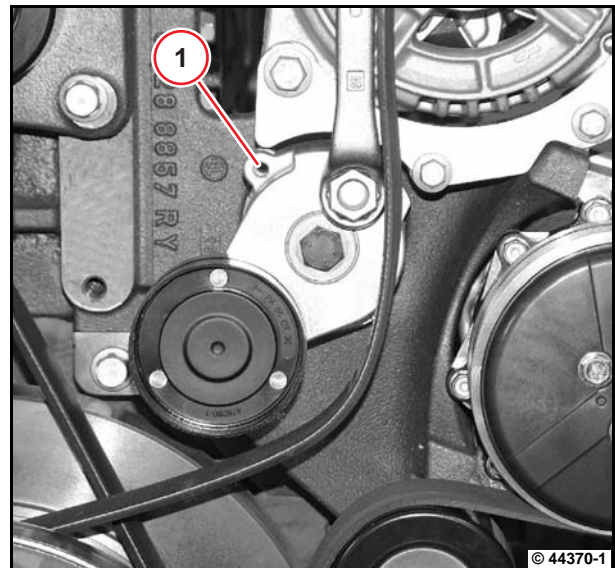


Pay attention to the running direction of the V-rib belt.

- Install connecting cables.
- Fill air conditioning.

**Attention!**

Observe instructions of vehicle manufacturer.





## Removing and installing the generator (operating side)



Commercial available tools



– Operation manual

6

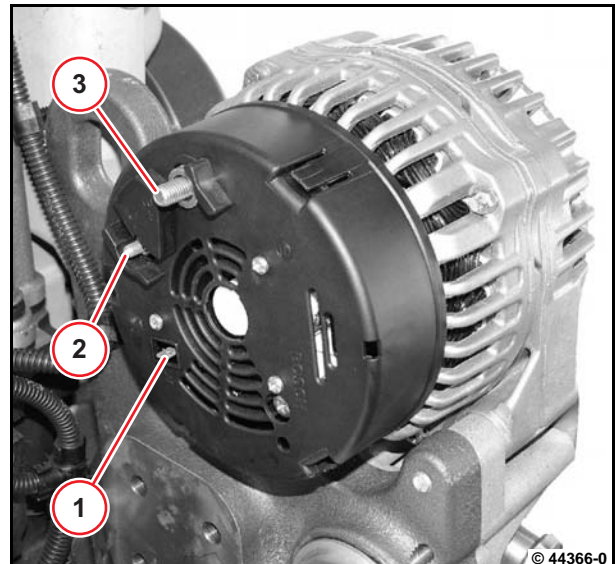
### Removing the generator

- Disconnect the battery's negative terminal.
- Remove cable from generator.



Note assignment!

- (1) = terminal W
- (2) = terminal D+
- (3) = terminal B+

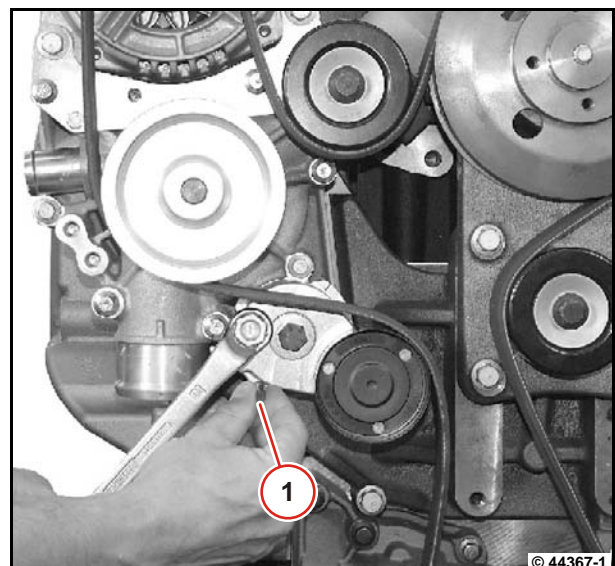


- Check the wear limit of the V-rib belt.



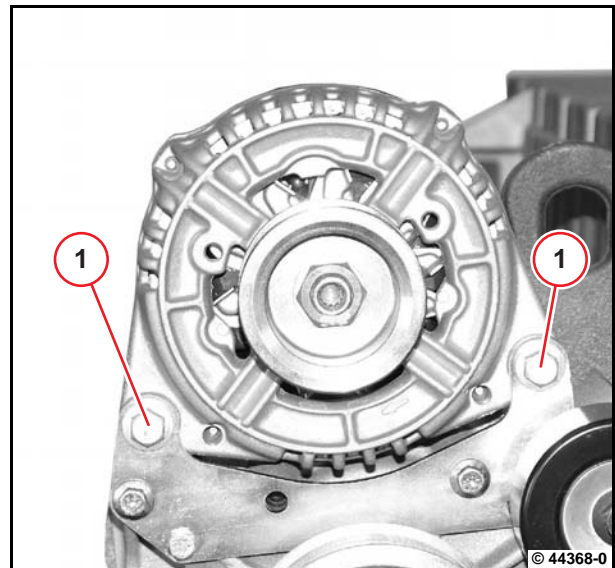
Operation manual

- Mark the running direction of the V-rib belt.
- Relieve the V-rib belt tension with the belt tightener.
- Insert holding pin (1).
- Remove V-rib belt.





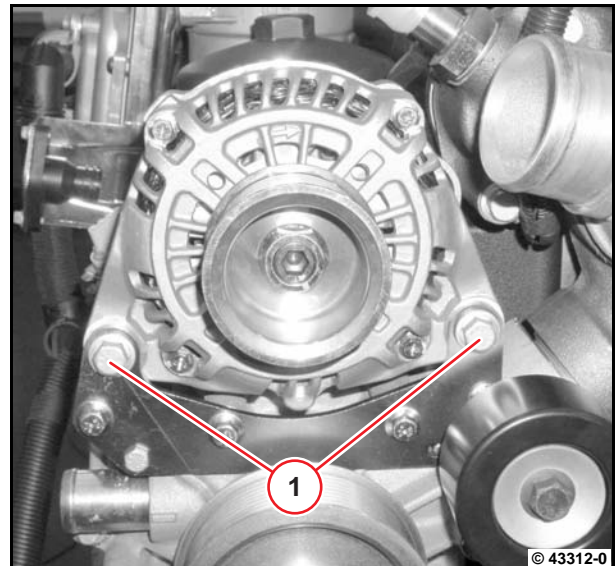
- Unscrew screws (1).
- Remove generator.



### Installing the generator

- Mount generator.
- Tighten screws (1).

 **A13 012**



- Remove cable from generator.



Note assignment!

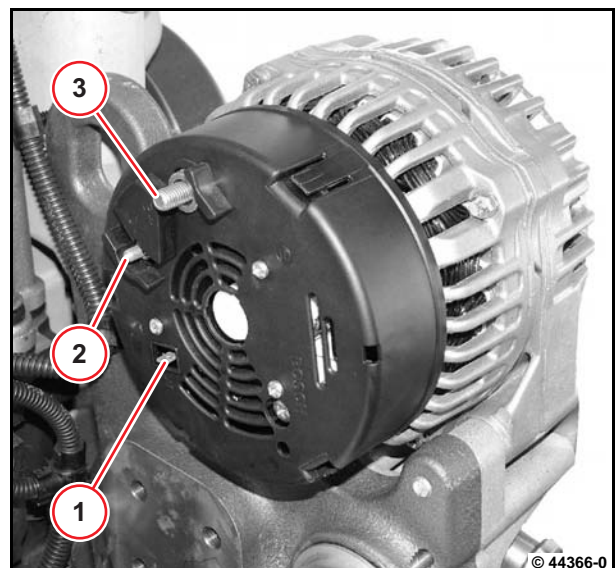
- (1) = terminal W
- (2) = terminal D+
- (3) = terminal B+

- Tighten cable on connection (2).

 **A13 082**

- Tighten cable on connection (3).

 **A13 081**



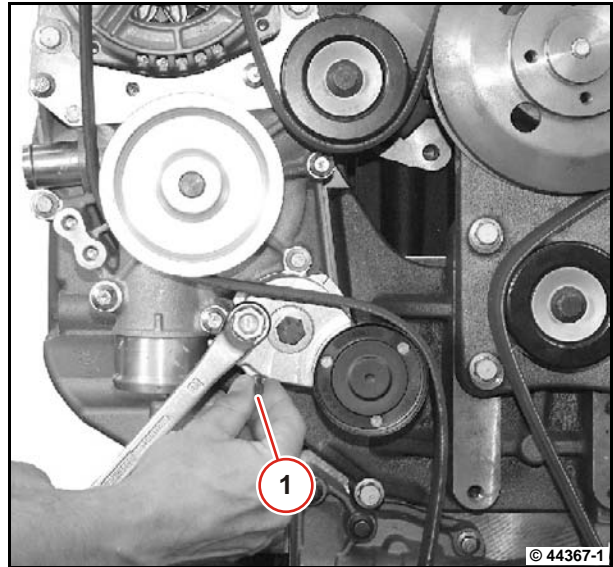
- Fit the V-rib belt according to the running direction.
- Relieve the belt tightener.
- Remove holding pin (1).



Ensure that the installation location is free from faults.

The belt tightener clamps the V-rib belt automatically.

- Connect the battery.





## Removing and installing the generator (outlet side)



Commercial available tools



– Operation manual

6

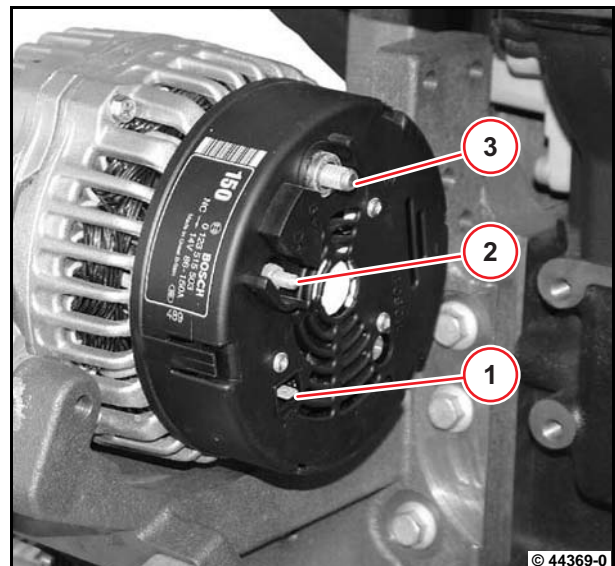
### Removing the generator

- Disconnect the battery's negative terminal.
- Remove cable from generator.



Note assignment!

- (1) = terminal W
- (2) = terminal D+
- (3) = terminal B+

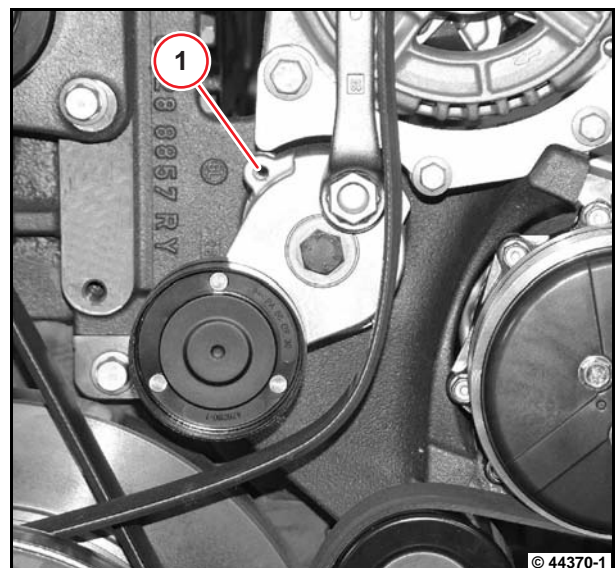


- Check the wear limit of the V-rib belt.

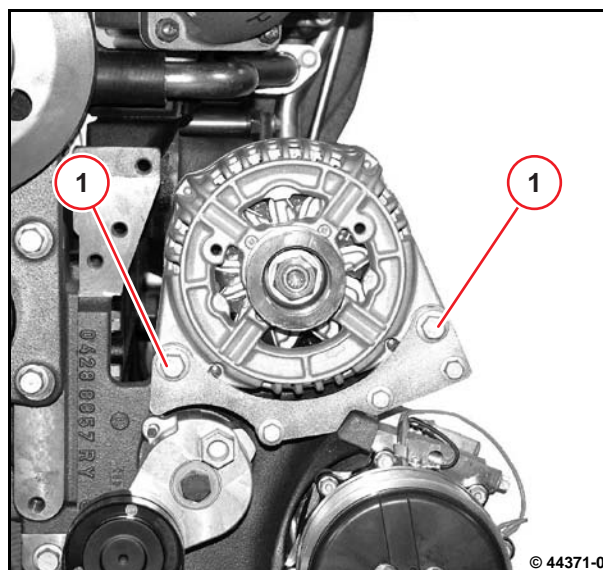


Operation manual

- Mark the running direction of the V-rib belt.
- Relieve the V-rib belt tension with the belt tightener.
- Insert holding pin (1).
- Remove V-rib belt.



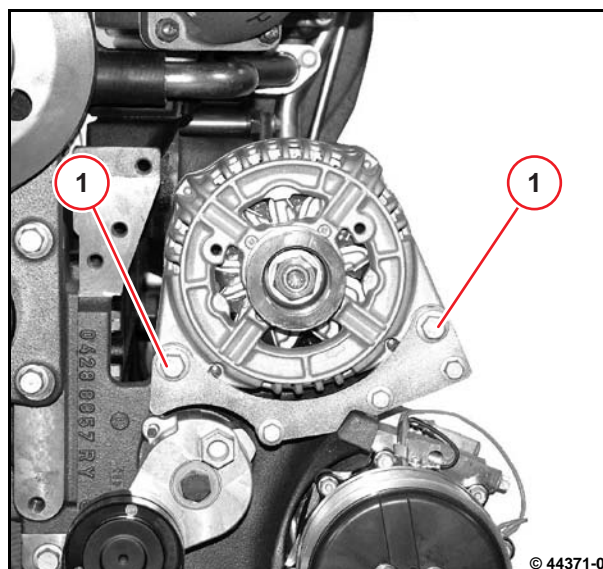
- Unscrew screws (1).
- Remove generator.



### Installing the generator

- Mount generator.
- Tighten screws (1).

 **A13 012**



- Remove cable from generator.



Note assignment!

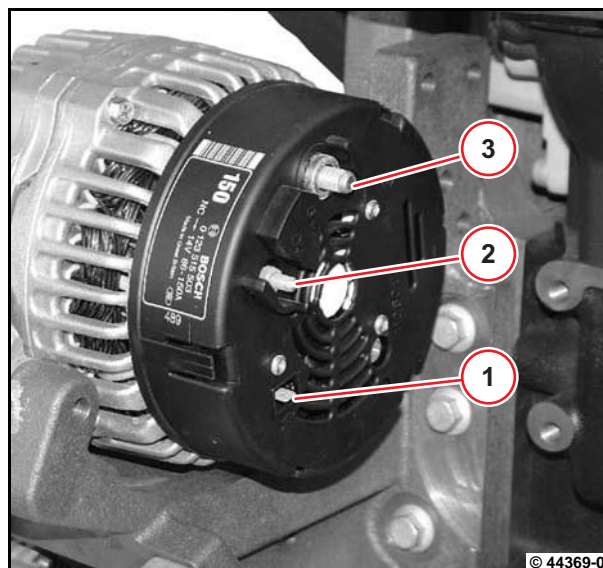
- (1) = terminal W
- (2) = terminal D+
- (3) = terminal B+

- Tighten cable on connection (2).

 **A13 082**

- Tighten cable on connection (3).

 **A13 081**





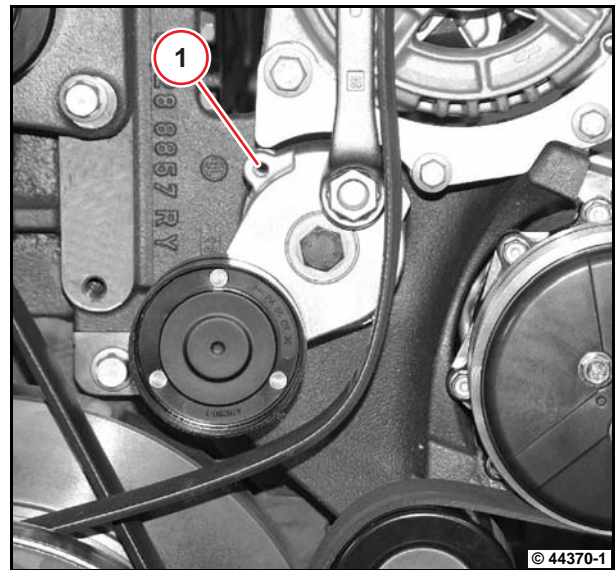
- Fit the V-rib belt according to the running direction.
- Relieve the belt tightener.
- Remove holding pin (1).



Ensure that the installation location is free from faults.

The belt tightener clamps the V-rib belt automatically.

- Connect the battery.







## Removing and installing the starter

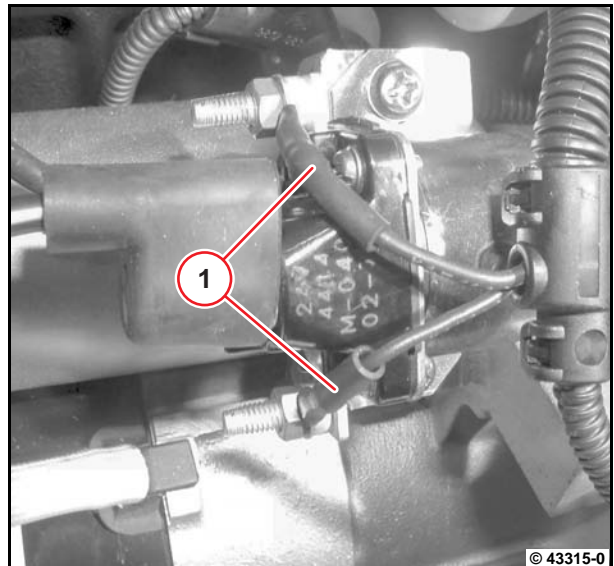


Commercial available tools

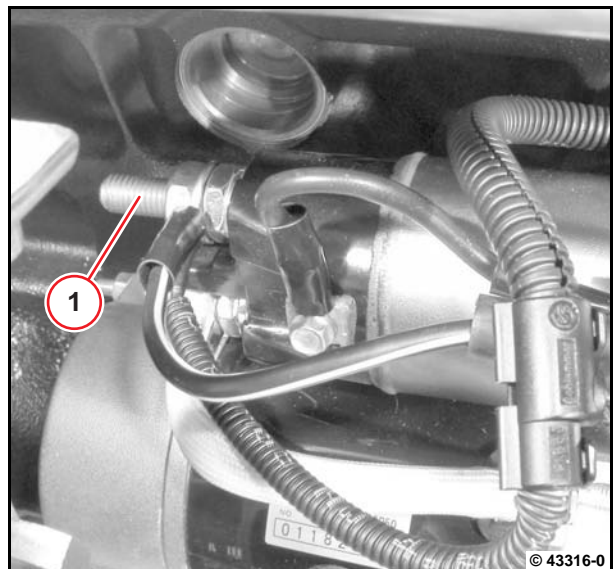
**6**

### Removing the starter

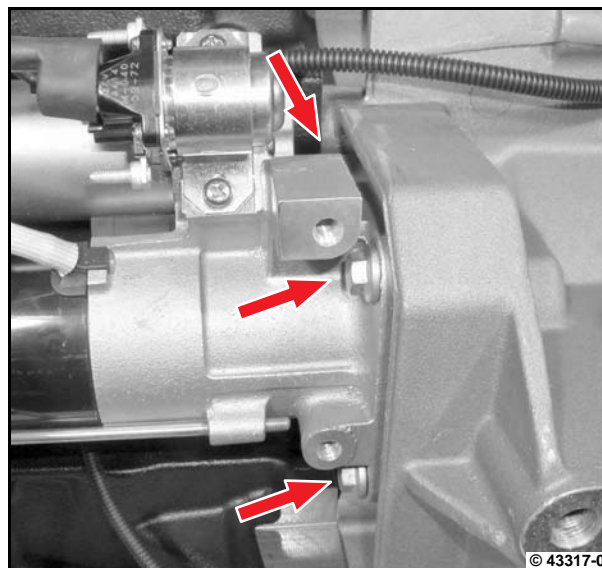
- Disconnect the battery.
- Remove cable (1) from relay.



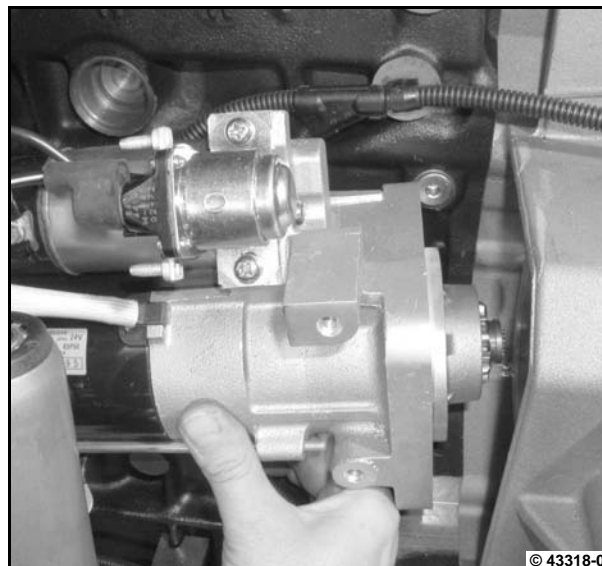
- Remove charging current cable from connection (1).



- Unscrew screws (arrows).



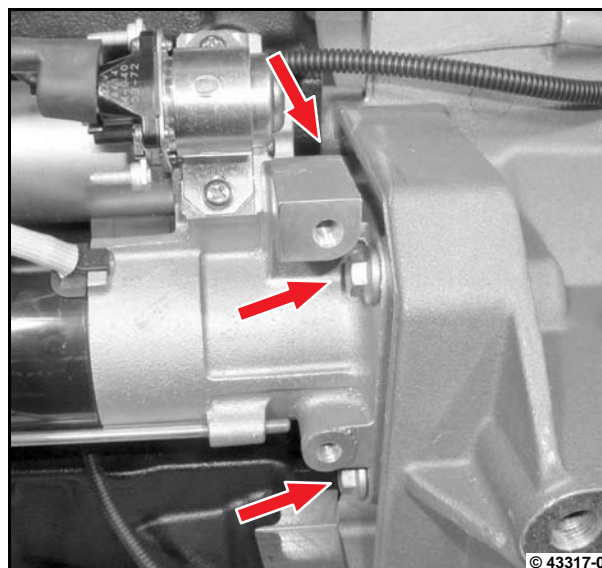
- Remove starter.



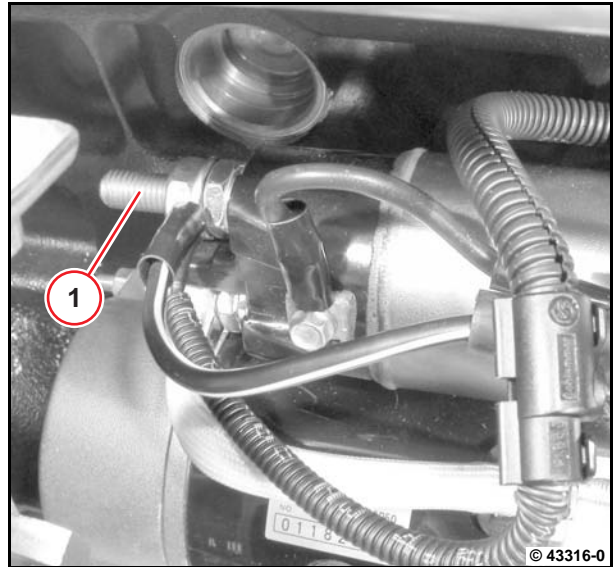
### Installing the starter

- Insert starter.
- Tighten screws (arrows).

 **A13 001**



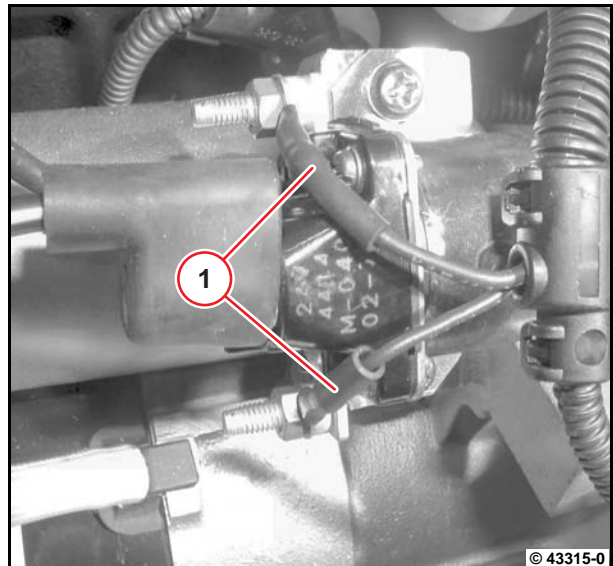
- Plug charging current cable to connection (1).

 **A13 071****6**

- Fix cable (1) to relay.

 **A13 073**

- Connect the battery.





## Removing and installing the pressure/temperature sensor (charge air)



Commercial available tools

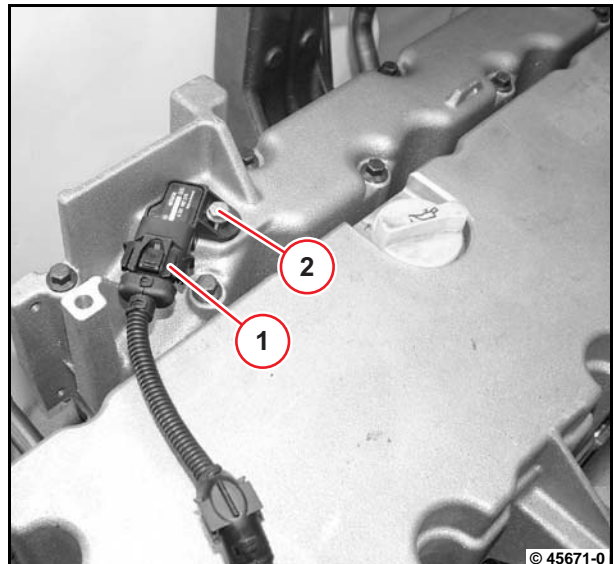


– Fitting compound  
DEUTZ AP1908

**6**

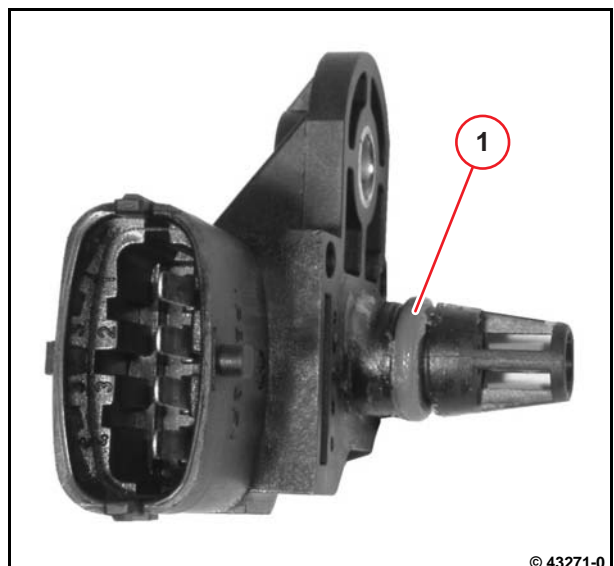
### Remove pressure/temperature sensor

- Unlock cable plug (1) and remove.
- Unscrew screw (2).
- Remove pressure/temperature sensor
- Visually inspect the component.



### Installing the pressure/temperature sensor

- Mount new O-ring (1).
- Lightly coat O-ring with fitting compound.





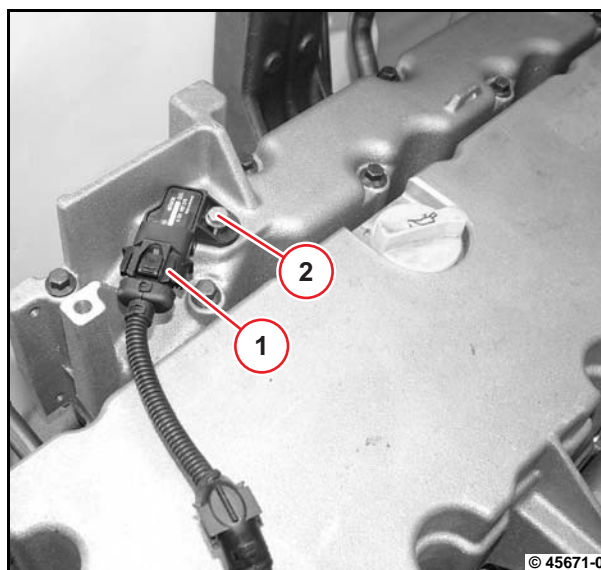
- Insert pressure/temperature sensor.
- Tighten screw (2).

 **A13 046**

- Plug in the cable plug (1).



Ensure that the connection is perfect.



## **7     Standard tools**



### Orders

The tools can be ordered directly, stating the order number, from:

WILBAER

Wilhelm Bäcker GmbH & Co.KG

Postfach 14 05 80

42826 Remscheid

Germany

Tel.: +49 (0) 2191 9339-200

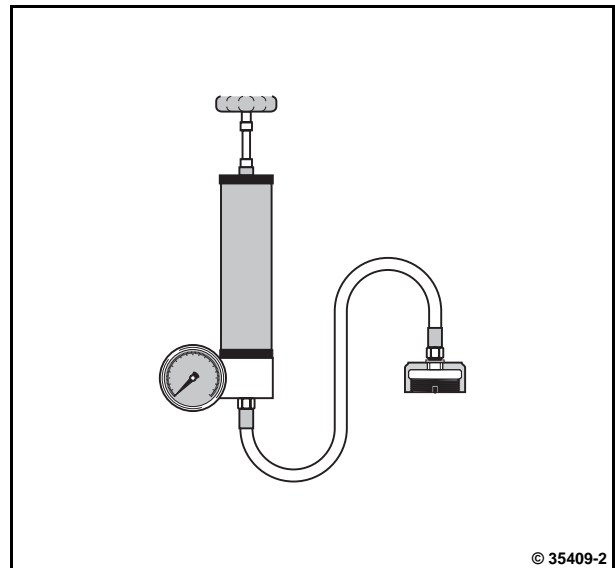
Fax: +49 (0) 2191 9339-0

E-mail: [info@wilbaer.de](mailto:info@wilbaer.de)

Web: <http://www.deutz-tools.com>

**8002****Pressure pump**

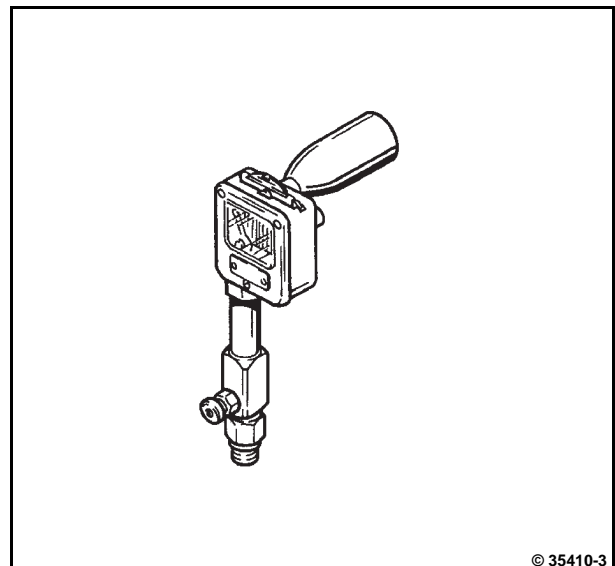
Checking cooling system for leak-tightness

**8005****Compression pressure tester**

for diesel engines

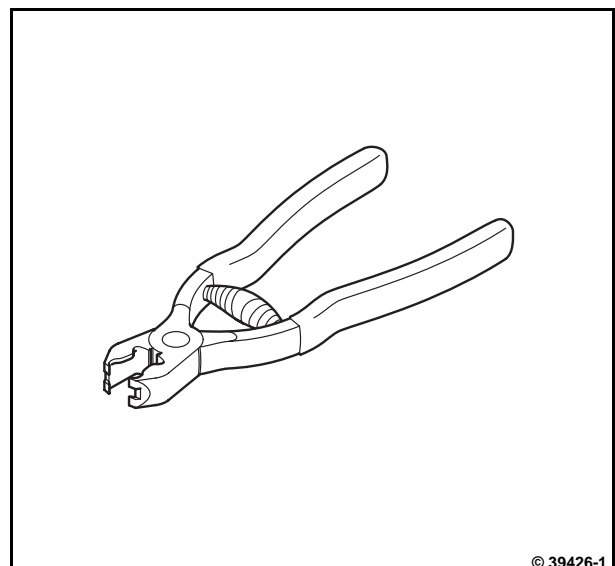
10 - 40 bar

Checking compression pressure

**8011****Hose clip pliers**

Loosen and fasten hose clips

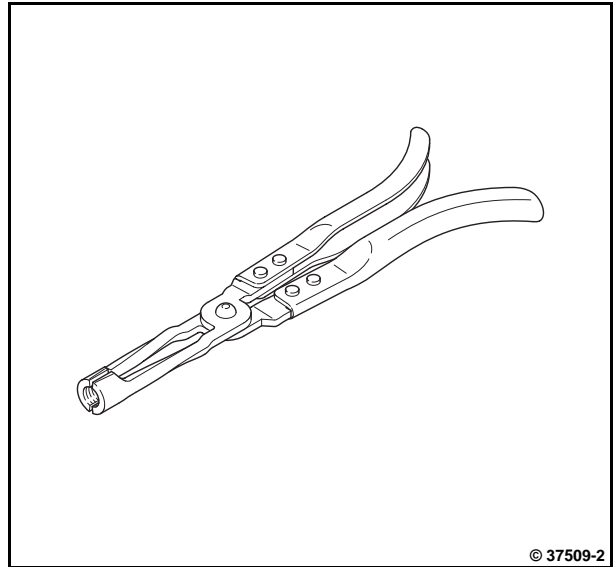
e. g. fuel return pipe



**8024**

**Assembly pliers**

e. g. removing valve stem seals

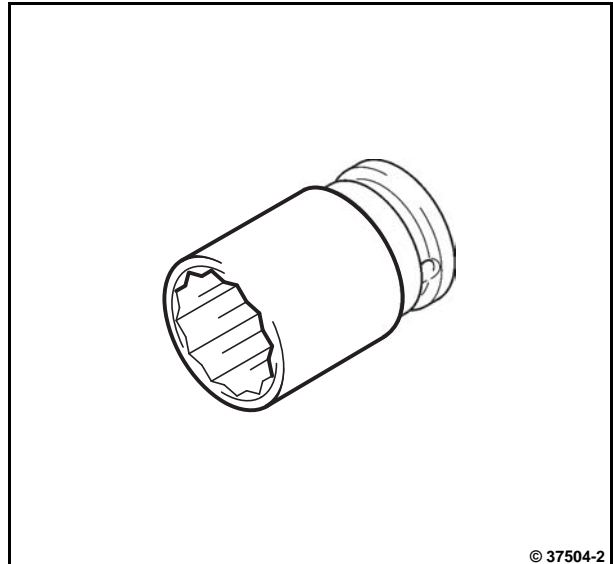


**8035**

**Socket wrench insert**

reinforced, size 22

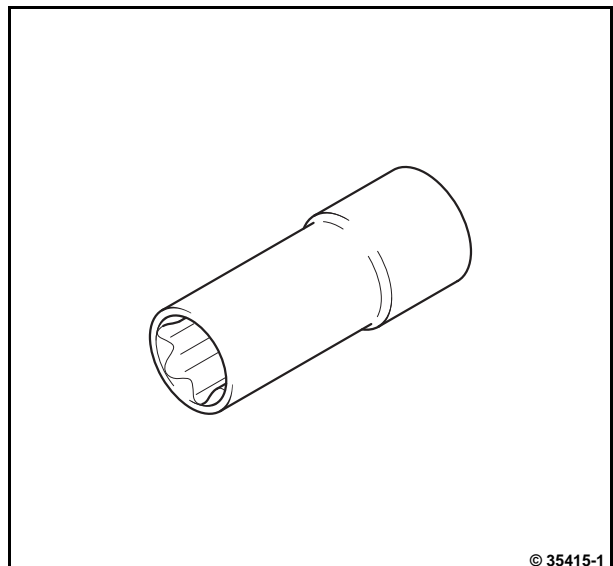
removing and installing main bearing



**8114**

**Socket wrench insert**

Torx - E 20

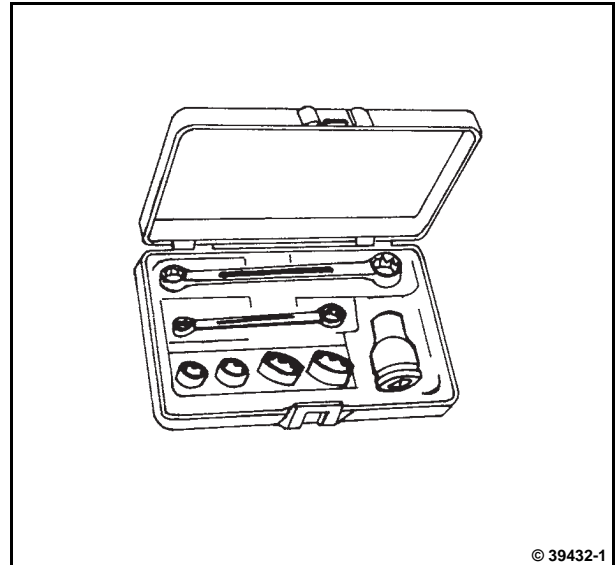


### 8189

#### Torx tool set

Contents of case:

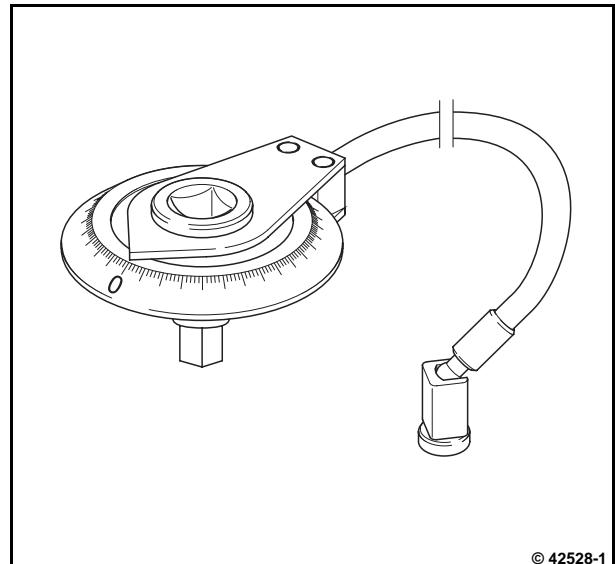
- Double-ended ring spanner E6/E8
- Double-ended ring spanner E10/E12
- Socket wrench insert E8 and E10 (1/4 inch)
- Socket wrench insert E10 and E12 (3/8 inch)
- Socket wrench insert E18 (1/2 inch)



### 8190

#### Rotation angle disc

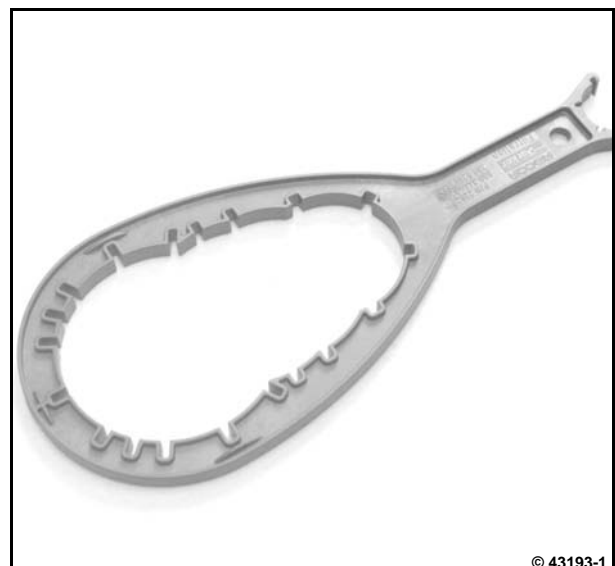
with magnet (e. g. setting valve clearance)



### 8192

#### Bowl wrench

Fuel pre-filter (type: Racor)

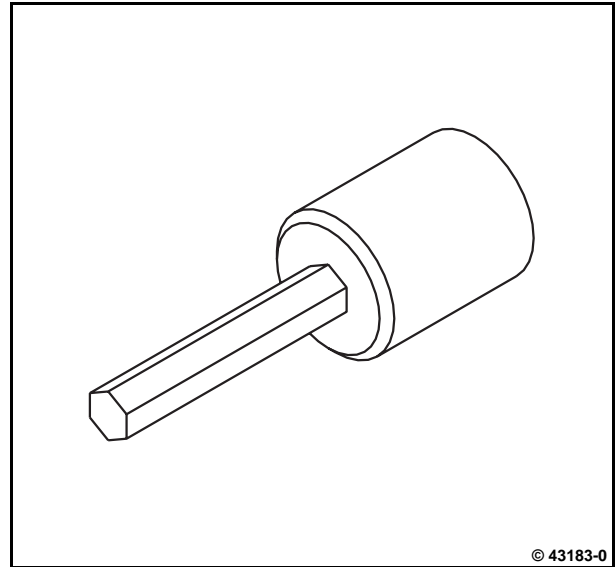




### 8193

#### Screwdriver insert

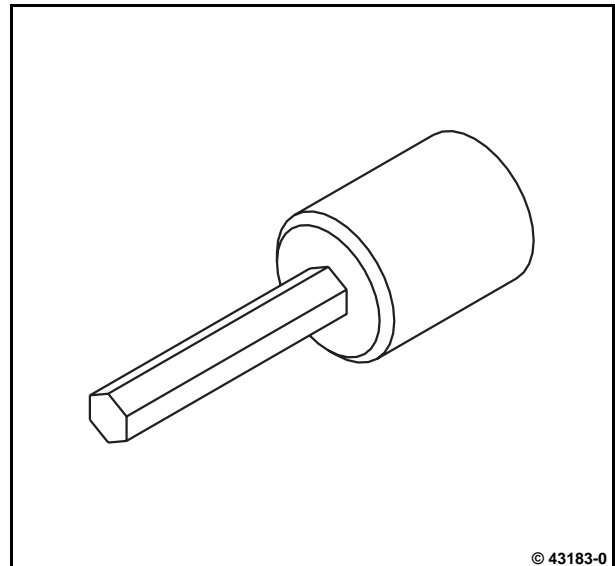
with pressed in hexagonal pin (5 mm),  
1/2 inch, long version  
(in conjunction with rotation angle disc 8190)



### 8194

#### Screwdriver insert

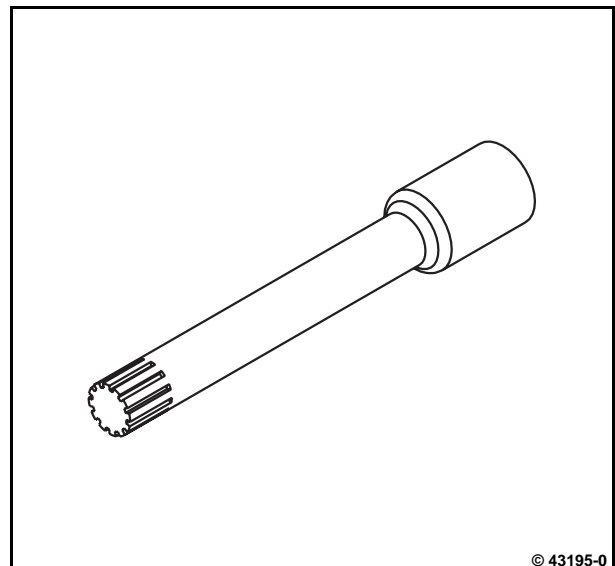
with pressed in hexagon pin (4 mm),  
3/8 inch, long version  
(in connection with rotation angle disc 8190 and reducer 1/2 to 3/8 inch)



### 8195

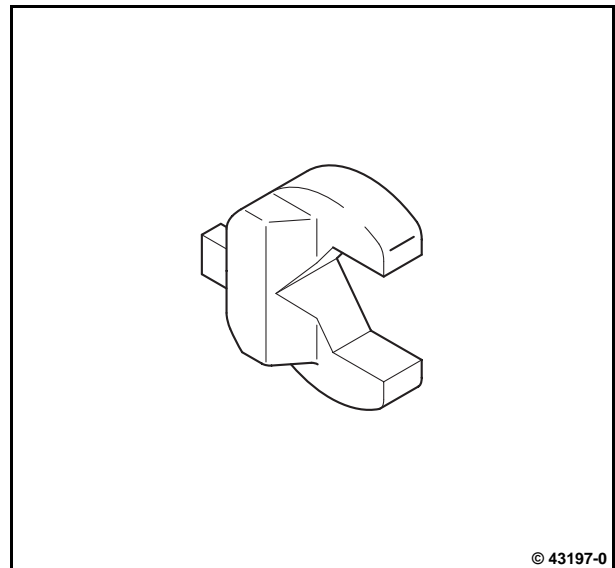
#### Multi-toothed screwdriver set

260 mm long  
Remove and install air compressor



**8196****Open end wrench adapter**

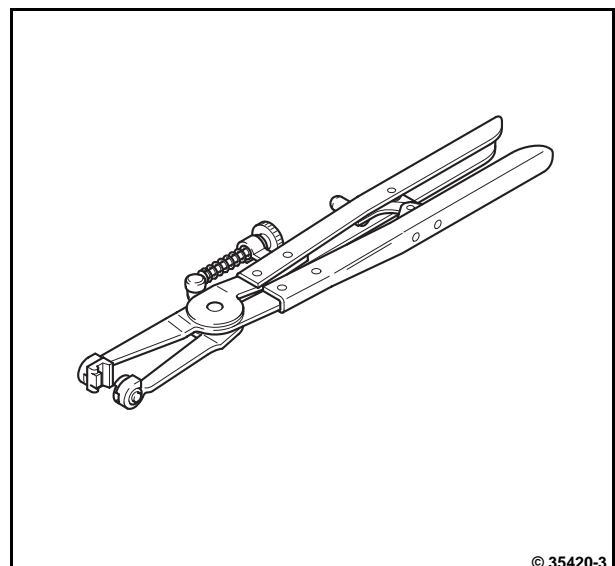
Size 13,  
for torque wrench  
Tighten lock nut of the valve clearance setting screw.

**8198****Pricker**

Removing rotary shaft lip seal

**9090****Spring band pliers**

320 mm  
Tighten spring clamp





## **8 Special tools**

### Orders

The tools can be ordered directly, stating the order number, from:

WILBAER

Wilhelm Bäcker GmbH & Co.KG

Postfach 14 05 80

42826 Remscheid

Germany

Tel.: +49 (0) 2191 9339-200

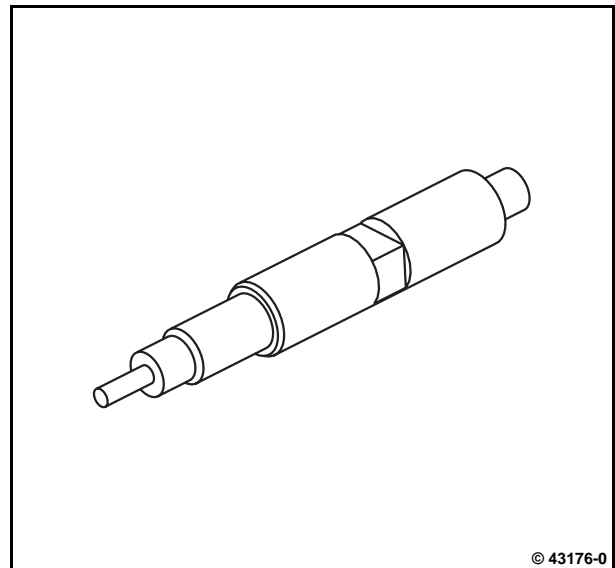
Fax: +49 (0) 2191 9339-0

E-mail: [info@wilbaer.de](mailto:info@wilbaer.de)

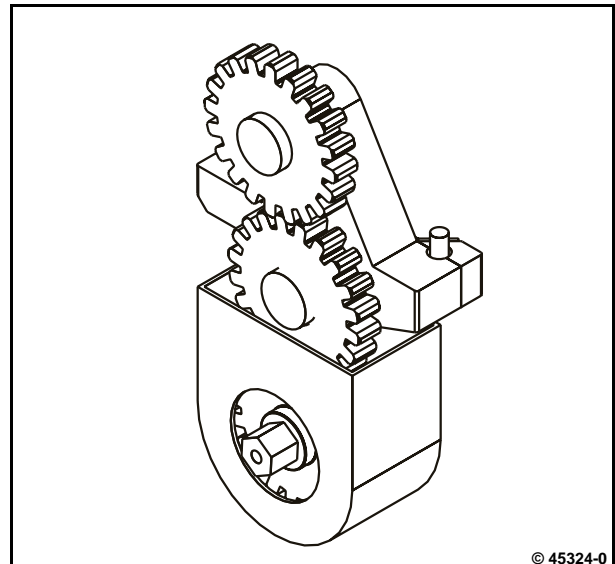
Web: <http://www.deutz-tools.com>

**100180****Connector**

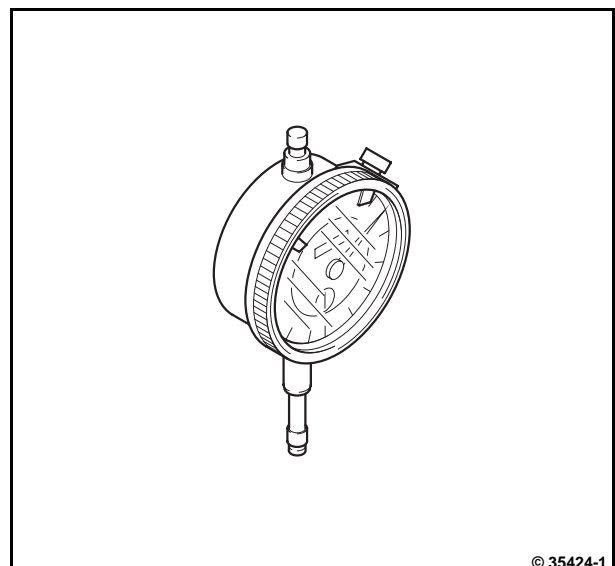
(in conjunction with compression pressure tester 8005)

**100370****Turning gear**

Turning the crankcase on the flywheel

**8****100400****Dial gauge with fixing wheel**

Measuring range 0 - 10 mm / 0.01 mm

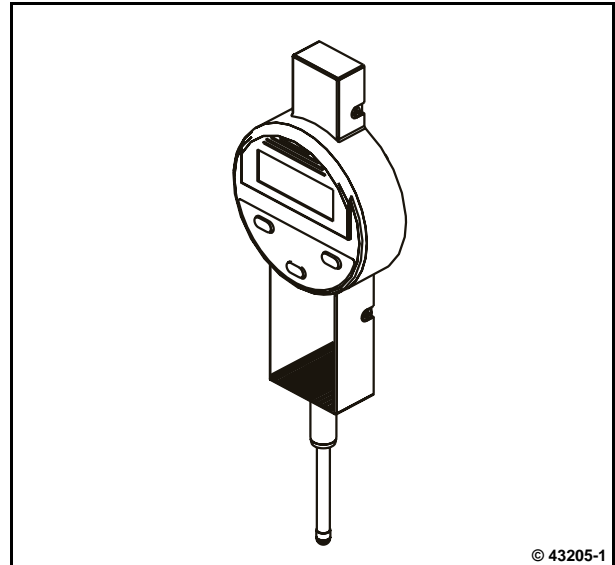




### 100410

#### Digital gauge

Measuring range 0 - 30 mm / 0.01 mm

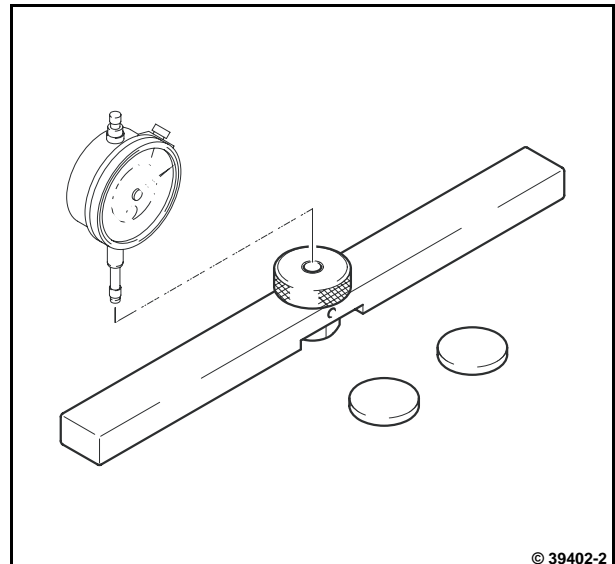


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### 100750

#### Measuring device

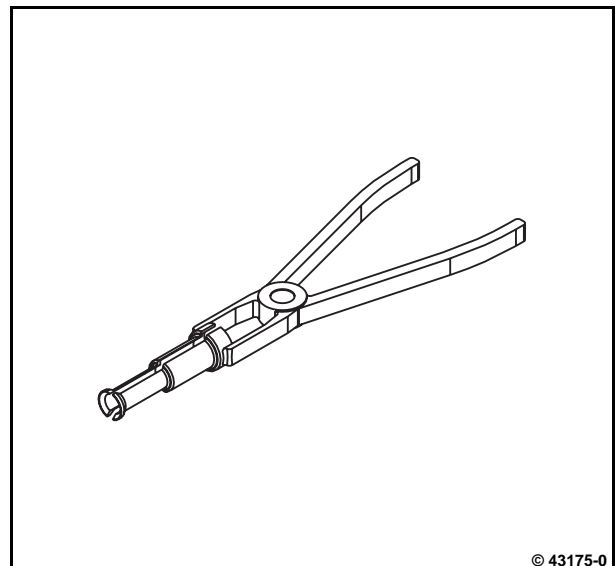
Measuring bar with two shims  
(in conjunction with 100400 and 100410)  
Checking valve lag dimension  
Checking piston projection



### 103220

#### Special pliers

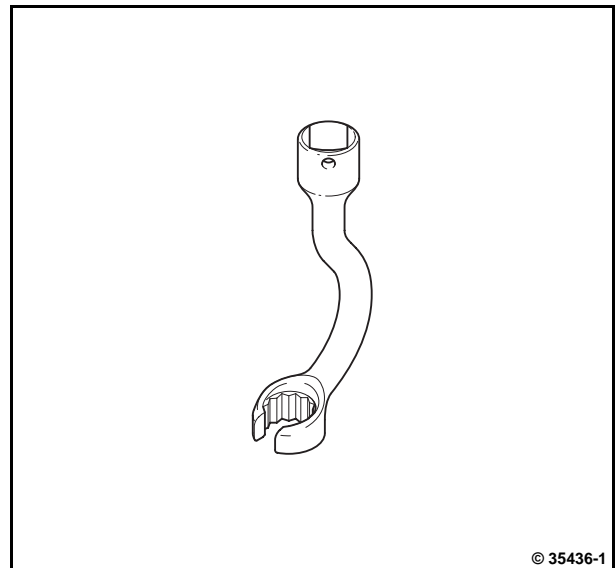
for removing the roller tappet



**110500****Special wrench**

Size 17

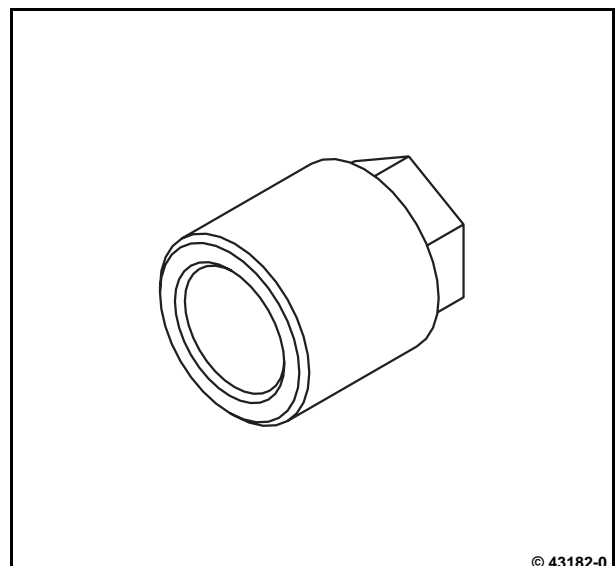
Removing and installing high-pressure lines

**110620****Lever tool**

Removing the injector

**8****110630****Disassembly device**

Removing the pressure pipe nozzle

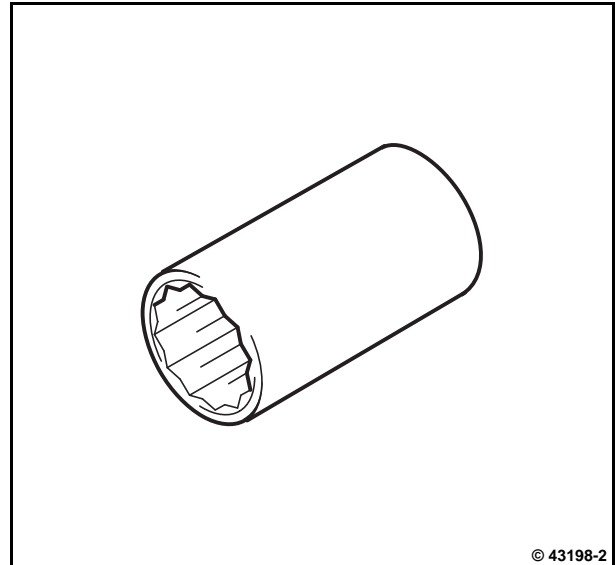


### 110700

#### Socket wrench insert

long

Installing and removing pressure sensors  
(rail pressure, oil pressure, fuel pressure)



8

### 110900

#### Assembly case

Case for O-rings, complete with:

Disassembly tool 110901 and three  
assembly sleeves with guide:

- High pressure pump (Ø 36), 110902
- Injector, 2V motor (Ø 16), 110903
- Injector, 4V motor (Ø 23), 110904

Removing and installing O-rings

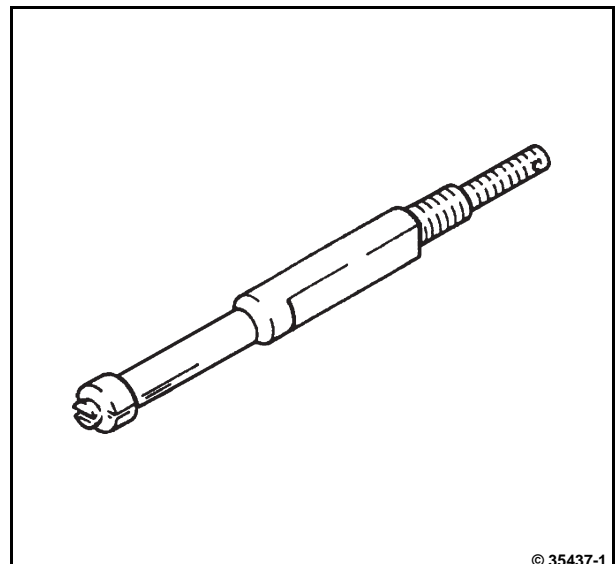


### 120680

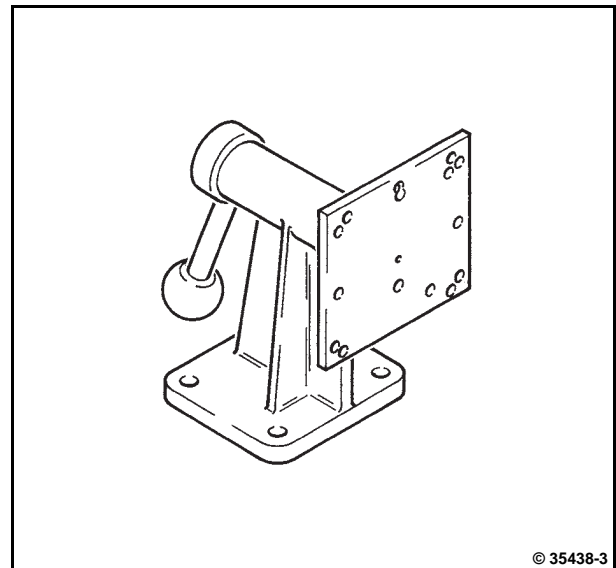
#### Puller

(in conjunction with slide hammer 150800)

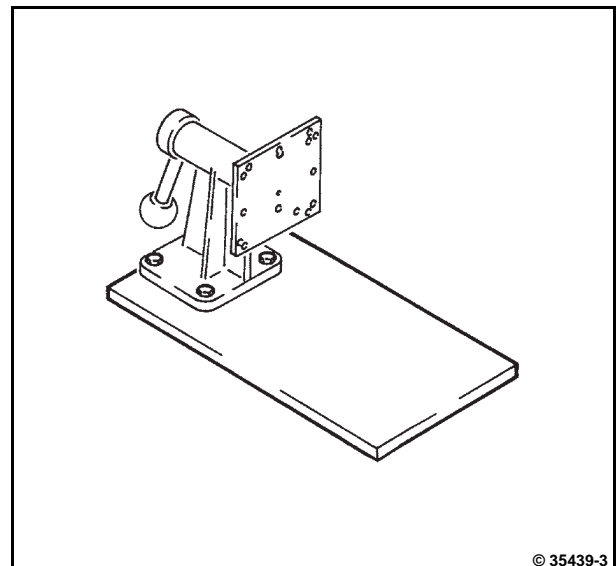
Removing jammed injector sealing ring



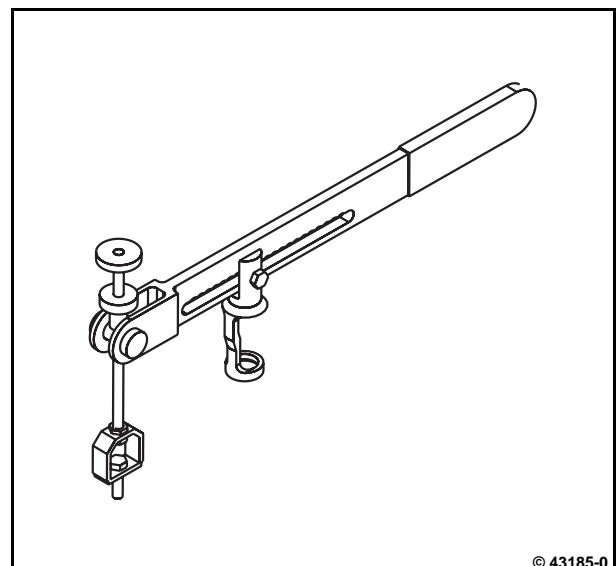
**120900**  
**Support bracket**  
 pivoting  
 Clamping cylinder head



**120910**  
**Base plate**  
 (in conjunction with support bracket 120900 if support bracket is not screwed tightly)



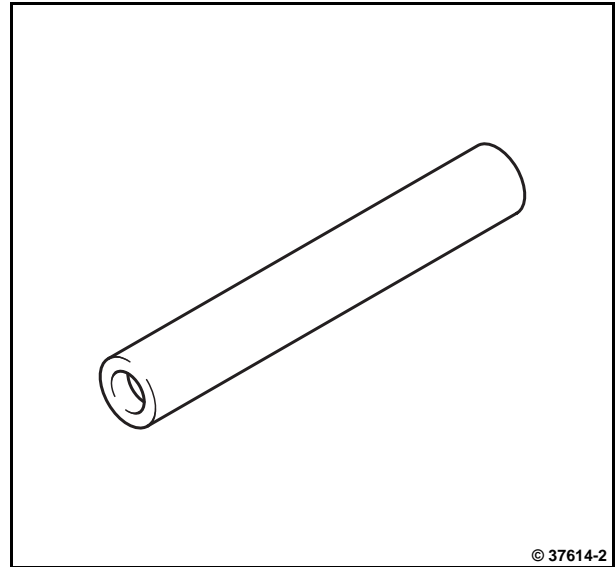
**121330**  
**Assembly lever**  
 Removing and installing the valves



**121410**

**Assembly tool**

Assembling valve stem gasket

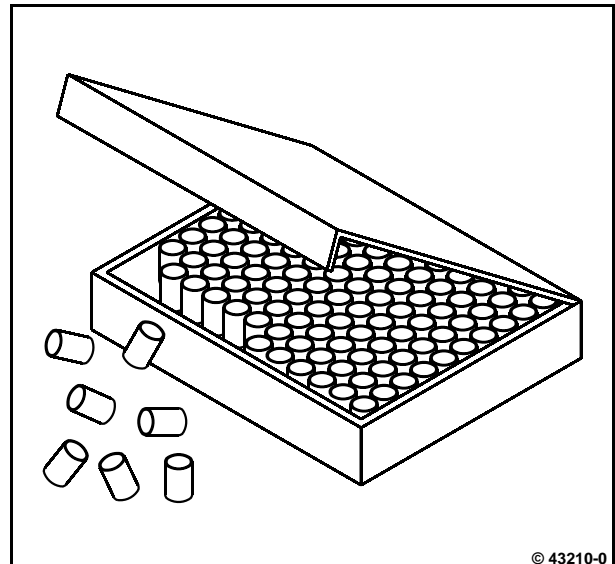


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**121420**

**Assembly sleeves**

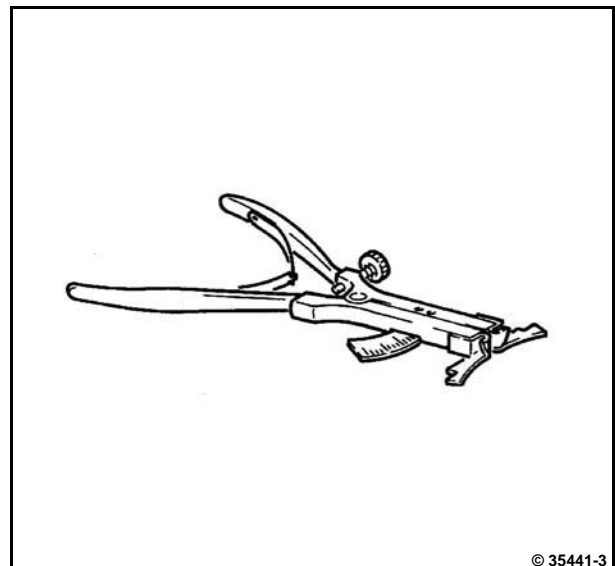
Set of assembly sleeves for valve stem gasket



**130300**

**Universal piston ring pliers**

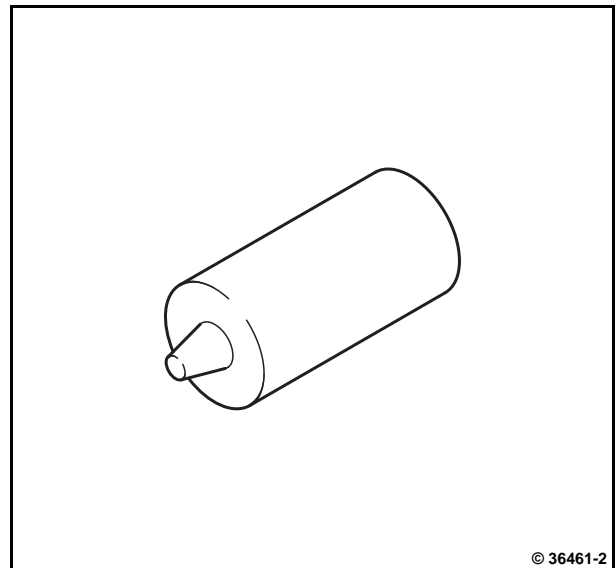
Removing and installing the piston rings



**130420****Trapezoidal groove wear gauge**

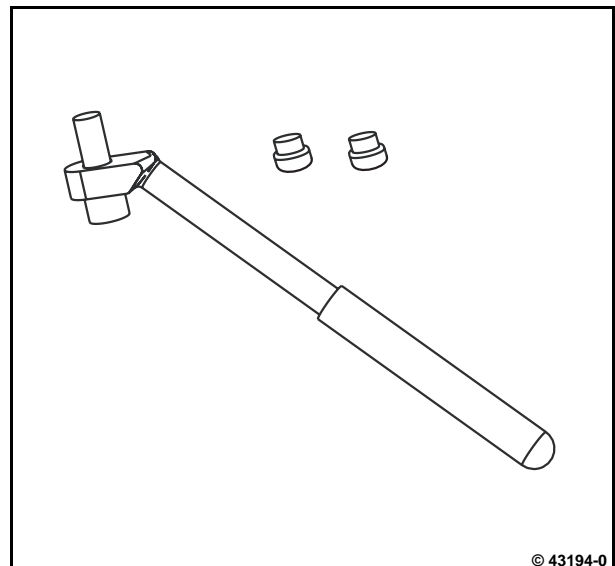
Piston diameter 108 mm

Checking piston ring groove

**130470****Assembly device**

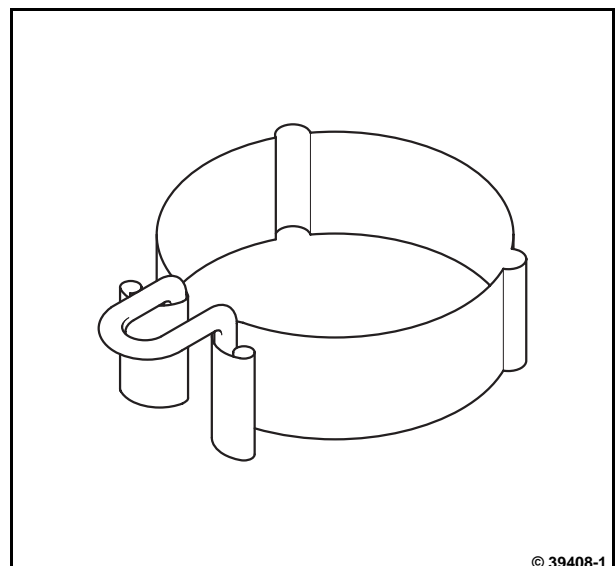
(incl. two protective plugs)

Removing and installing piston/con rod

**130640****Piston ring compressor**

Piston diameter 108 mm

Removing and installing piston rings

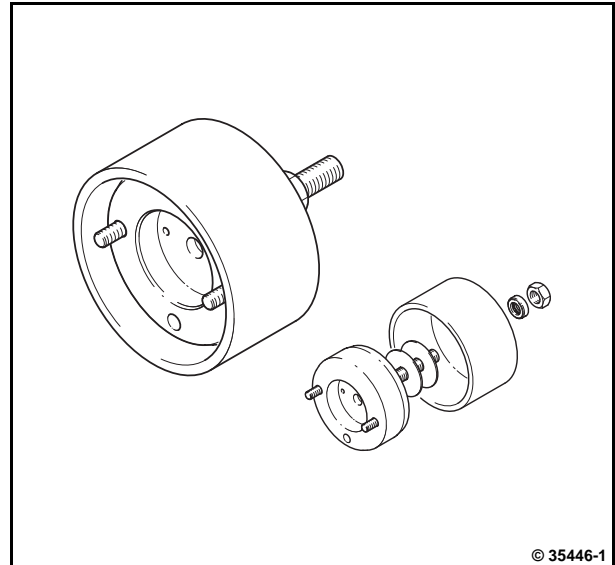




**142810**

**Assembly tool**

Installing crankshaft sealing ring  
(flywheel side)



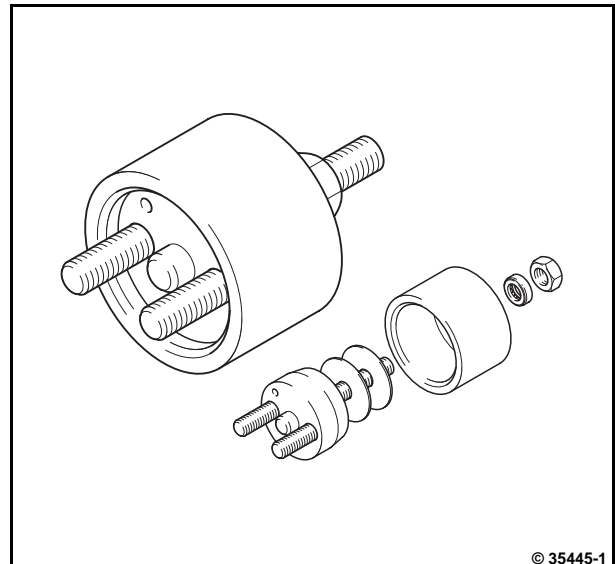
© 35446-1

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**142820**

**Assembly tool**

Installing crankshaft sealing ring  
(opposite side to flywheel)



© 35445-1

**150170**

**Puller, universal**

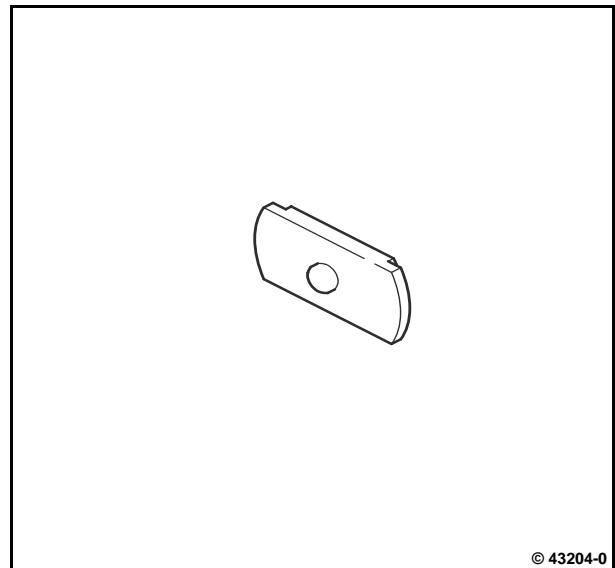
comprising traverse, support and threaded rod  
(in conjunction with disc 150171)  
Removing cylinder liner



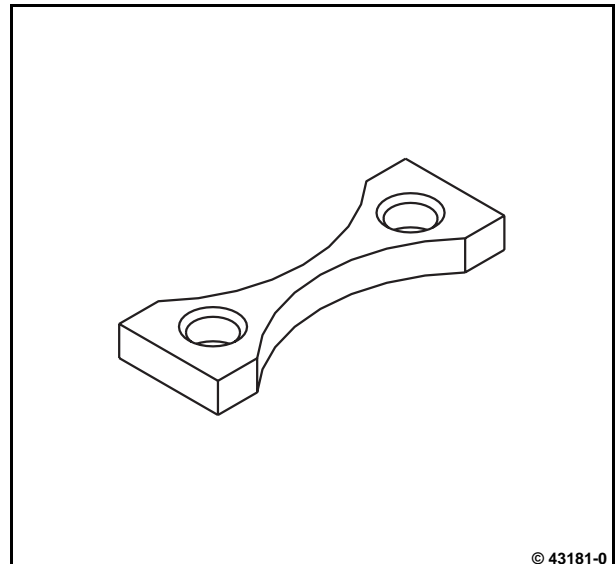
© 43207-0

**150171****Plate**

(in conjunction with disassembly device 150170)  
for liner diameter: 108 mm  
Removing cylinder liner

**150180****Liner holder**

(Set comprises 7 holders)  
Turning crankshaft with cylinder head removed

**150190****Assembly lever**

Lever with bolts  
(in conjunction with disc 150191)  
Installing cylinder liner



### 150191

#### Washer

(in conjunction with assembly lever 150190)  
for liner diameter: 108 mm  
Installing cylinder liner

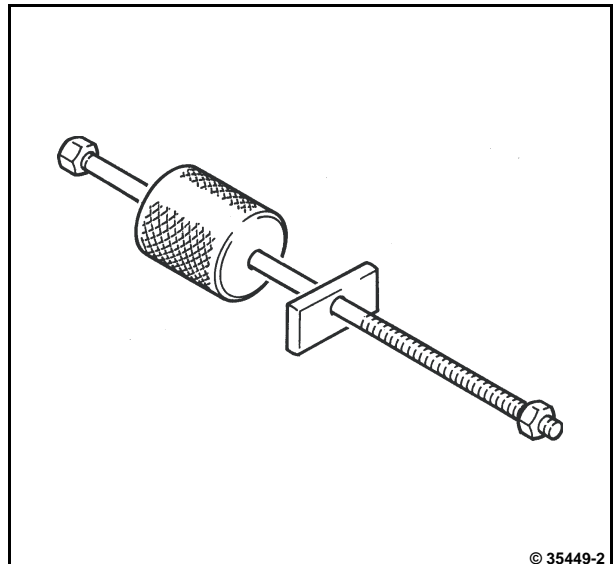


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### 150800

#### Slide hammer

(in conjunction with disassembly device 120680)  
Disassembling injector sealing ring



### 170160

#### Stoppers/caps

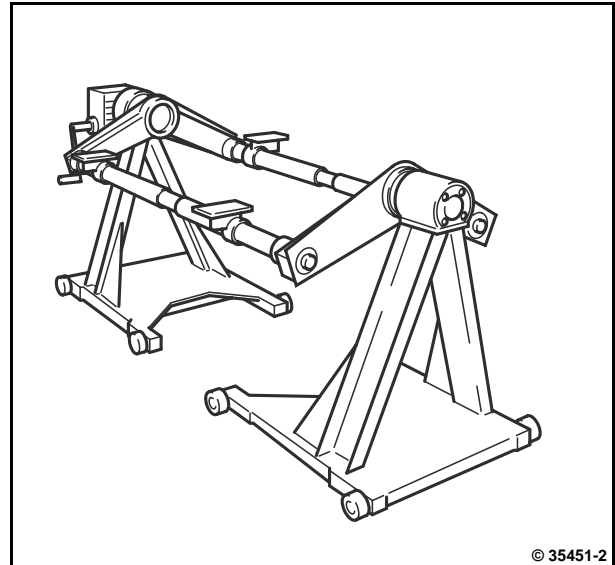
1 set of differently-sized stoppers and caps  
Sealing openings on the fuel system



### 6066

#### Assembly block

Engine clamping, double-sided maximum load capacity at middle centre of gravity approx. 1200 kg

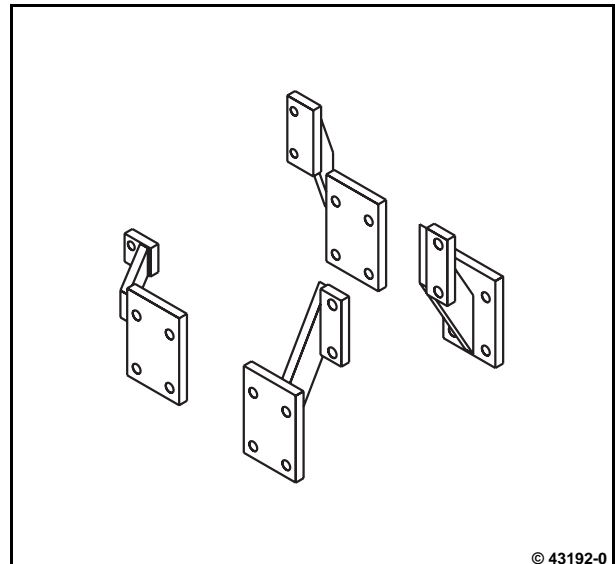


### 6066/210

#### Clamping bracket

(in conjunction with assembly block 6066)

Engine clamping, double-sided



### 6068

#### Engine lifting device

Load capacity (2t), 3-point suspension, spindle clamp, traverse, chains and hooks



**6692**  
**Slotted nut wrench**  
Cable plug

